PROJECT MANUAL

LANCASTER HS BASEBALL RESTROOM

325 WOODLAND DRIVE
LANCASTER, SC 29720

LS3P COMMISSION NUMBER: 2201-231926

CONSTRUCTION DOCUMENTS

MARCH 15, 2024

ARCHITECT

LS3P

701 Lady Street #A
Columbia, SC 29201

FIRE RETARDANT TREATED WOOD IS NOT ALLOWED BY OSF GUIDE, SECTION 1.9.B

Reviewed For Code Compliance

These set of Construction Documents and/or Specifications have been reviewed for Code Compliance. Any changes or alterations to these documents shall be approved by the Building Official [Office of Schools Facilities (OSF)]. This review for code compliance does not relieve the design professional representing the district from code omissions as interpreted by the OSF; nor the owner, contractor or their representatives from the responsibility to comply with all OSF Regulations, Local, State and National Codes and Standards in effect at the time of the Building Permit issuance. This plan review does not prevent this office from requiring corrections during construction to meet code requirements.

Stamped Plans and Specifications are required to be on site for inspections.

OSF Plan Reviewer_____ Date 07.29.2024
S.C. Department of Education – Office of School Facilities
Electronic Stamp

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DOCUMENT 000107 – PROJECT DIRECTORY AND SEALS PAGES

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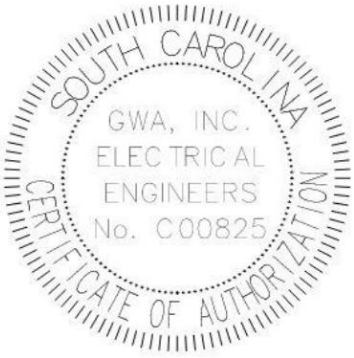
ELECTRICAL ENGINEER GWA, Inc. 168 Laurelhurst Avenue Columbia, SC 29201 803.252.6919	GWA, Inc. Corporate License #C00825	
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DOCUMENT 001116 - INVITATION TO BID

1.1 PROJECT INFORMATION

A. Notice to Bidders: Prequalified bidders are invited to submit bids for Project as described in this Document according to the Instructions to Bidders.

B. Project Identification: Lancaster HS Baseball Restroom, 2201-231926.

1. Project Location: 325 Woodland Drive, Lancaster, SC 29720.

C. Owner: Lancaster County School District | 300 South Catawba Street, Lancaster, SC 29720.

1. Owner's Representative: Tim Bowers | tim.bowers@lcsd.k12.sc.us.
2. Architect: Allen Taylor, AIA | allentaylor@ls3p.com.

D. Project Description: Work required for this project includes a new single-story building of Type IIB construction with Group U occupancy. Major construction systems include slab-on-grade floors, concrete masonry load bearing exterior walls, single ply EPDM roofing membrane on rigid foam board insulation on wood decking. Exterior doors and frames are hollow metal with fixed louver transoms and interior doors are phenolic on hollow metal frames. Interior finishes include sealed concrete floors, paint, and hard gypsum ceilings. Site work and other Work indicated in the Contract Documents will be required.

E. Construction Contract: Bids will be received for the following Work:

1. General Contract (all trades).

1.2 BID SUBMITTAL AND OPENING

A. Owner will receive sealed bids until the bid time and date at the location indicated below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:

1. Bid Date: TBD.
2. Bid Time: 10:00 a.m.
3. Location: Lancaster County School District Facilities, 1321 Springdale Road, Lancaster, SC 29720.

B. Bids sent by mail or other special delivery service (UPS, FED-EX, etc.) should be labeled "Bid Enclosed" with the bid number displayed on the envelope. Bids shall be received at Lancaster County School District Facilities, 1321 Springdale Road, Lancaster, SC 29720 prior to the time of the bid opening. Bids not received prior to the time of the bid opening shall be rejected as being nonresponsive.

C. Bids will be thereafter publicly opened and read aloud.

1.3 BID QUESTION

A. All bidding questions to be submitted by _____.

1. Submit questions to Tyler McKenzie at tylermckenzie@ls3p.com.

1.4 BID SECURITY

A. Bid security shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.5 PREBID CONFERENCE

A. A Prebid conference for all bidders will be held at Lancaster County School District Facilities, 1321 Springdale Road, Lancaster, SC 29720 on January 24, 2024. Prospective bidders are strongly requested to attend.

1.6 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. Bidders shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time. Work is subject to liquidated damages.

B. Liquidated damages shall be imposed at the rate of $500 per calendar day after the date set for substantial completion, which is 11/23/18.

1.7 BIDDER'S QUALIFICATIONS

A. Bidders must be prequalified by Owner.

B. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, a separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.

END OF DOCUMENT 001116

DOCUMENT 002113 - INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

A. AIA Document A701, "Instructions to Bidders," is hereby incorporated into the Procurement and Contracting Requirements by reference.

1. A copy of AIA Document A701, "Instructions to Bidders," is bound in this Project Manual.

END OF DOCUMENT 002113

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AIA® Document A701® – 2018

Instructions to Bidders

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

Lancaster HS Baseball Restrooms
325 Woodland Drive
Lancaster, SC 29720

THE OWNER:
(Name, legal status, address, and other information)

Lancaster County School District
300 S. Catawba Street
Lancaster, SC 29720

THE ARCHITECT:
(Name, legal status, address, and other information)

LS3P Associates LTD.
701 – A Lady Street
Columbia, SC 29201

TABLE OF ARTICLES

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:
(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids
Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)
§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement
Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability
A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals
§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

.1 a designation of the Work to be performed with the Bidder's own forces;
.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements
§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds
§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS
§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

Additions and Deletions Report for

AIA® Document A701® – 2018

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 16:14:30 ET on 12/14/2023.

PAGE 1

Lancaster HS Baseball Restrooms
325 Woodland Drive
Lancaster, SC 29720

...

Lancaster County School District
300 S. Catawba Street
Lancaster, SC 29720

...

LS3P Associates LTD.
701 – A Lady Street
Columbia, SC 29201

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 16:14:30 ET on 12/14/2023 under Order No. 3104239711 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ – 2018, Instructions to Bidders, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

ADDITIONAL INSTRUCTIONS TO BIDDERS

CERTIFICATE OF INDEPENDENT PRICE DETERMINATION: GIVING FALSE, MISLEADING, OR INCOMPLETE INFORMATION ON THIS CERTIFICATION MAY RENDER YOU SUBJECT TO PROSECUTION UNDER SECTION 16-9-10 OF THE SOUTH CAROLINA CODE OF LAWS AND OTHER APPLICABLE LAWS.

(a) By submitting an offer, the Offeror certifies that:

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other Offeror or competitor relating to:

(i) Those prices;

(ii) The intention to submit an offer; or

(iii) The methods or factors used to calculate the prices offered.

(2) The prices in this offer have not been and will not be knowingly disclosed by the Offeror, directly or indirectly, to any other Offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the Offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory:

(1) Is the person in the Offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this certification; or

(2)(i) Has been authorized, in writing, to act as agent for the Offeror's principals in certifying that those principals have not participated, and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this certification [As used in this subdivision (b)(2)(i), the term "principals" means the person(s) in the Offeror's organization responsible for determining the prices offered in this bid or proposal].

(ii) As an authorized agent, does certify that the principals referenced in subdivision (b)(2)(i) of this certification have not participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this certification; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this certification.

(c) If the Offeror deletes or modifies paragraph (a)(2) of this certification, the Offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

CERTIFICATION REGARDING DEBARMENT AND OTHER RESPONSIBILITY MATTERS:

(a)

(1) By submitting an Offer, Offeror certifies, to the best of its knowledge and belief, that-

(i) Offeror and/or any of its Principals

(A) Are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any state or federal agency;

(B) Have not, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are not presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in paragraph (a)(1)(i)(B) of this provision.

(ii) Offeror has not, within a three-year period preceding this offer, had one or more contracts terminated for default by any public (Federal, state, or local) entity.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and,

persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

(b) Offeror shall provide immediate written notice to the Procurement Officer if, at any time prior to contract award, Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) If Offeror is unable to certify the representations stated in paragraphs (a)(1), Offer must submit a written explanation regarding its inability to make the certification. The certification will be considered in connection with a review of the Offeror's responsibility. Failure of the Offeror to furnish additional information as requested by the Procurement Officer may render the Offeror non-responsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly or in bad faith rendered an erroneous certification, in addition to other remedies available to the District, the Procurement Officer may terminate the contract resulting from this solicitation for default.

Check for federal and state disbarments at www.sam.gov and http://procurement.sc.gov/legal/legal-suspend-debar.

DISCLOSURE OF YOUR BID / PROPOSAL & SUBMITTING CONFIDENTIAL DATA

(a) According to Section 11-35-410, any person submitting a document in response or with regard to any solicitation or other request must "comply with instructions provided in the solicitation for marking information exempt from public disclosure. Information not marked as required by the applicable instructions may be disclosed to the public." IF YOU IDENTIFY YOUR ENTIRE RESPONSE AS EXEMPT FROM PUBLIC DISCLOSURE, OR IF YOU DO NOT SUBMIT A REDACTED COPY AS REQUIRED, THE DISTRICT MAY, IN ITS SOLE DISCRETION, DETERMINE YOUR BID OR PROPOSAL NONRESPONSIVE AND INELIGIBLE FOR AWARD.

(b) By submitting a response to this solicitation or request, Offeror agrees to the public disclosure of every page, or portion thereof, of every document regarding this solicitation or request that was submitted at any time prior to entering into a contract (including, but not limited to, documents contained in a response, documents submitted to clarify a response, and documents submitted during negotiations), unless the page, or portion thereof, was redacted and conspicuously marked "Trade Secret" or "Confidential" or "Protected", (2) agrees that any information not redacted and marked, as required by these bidding instructions, as a "Trade Secret" is not a trade secret as defined by the Trade Secrets Act, and (3) agrees that, notwithstanding any claims or markings otherwise, any prices, commissions, discounts, or other financial figures used to determine the award, as well as the final contract amount, are subject to public disclosure.

(c) If your offer includes any information that you claim is exempt from public disclosure, you must submit one complete copy of your offer from which you have removed or concealed such information (the redacted copy). Except for the information removed or concealed, the redacted copy must be identical to your original offer.

(d) Do not mark your entire response (bid, proposal, quote, etc.) as confidential, trade secret, or protected. If only portions of a page are subject to some protection, do not redact the entire page. The redacted copy must reflect the same pagination as the original and show the empty space from which information was redacted. The Procurement Officer must be able to view, search, copy and print the redacted copy without a password. If your response, or any part thereof, is improperly marked as confidential or trade secret or protected, the District may, in its sole discretion, determine it nonresponsive.

(e) On the redacted copy, you must identify the basis of your claim by marking each redaction as follows: You must separately mark with the word "CONFIDENTIAL" every page, or portion thereof, that you redacted and claim as exempt from public disclosure because it is either (1) a trade secret as defined in Section 30-4-40(a)(1) of the Freedom of Information Act, or (2) privileged and confidential, as that phrase is used in Section 11-35-410. You must separately mark with the words "TRADE SECRET" every page, or portion thereof, that you redacted and claim as exempt from public disclosure as a trade secret pursuant to Section 39-8-20 of the Trade Secrets Act. You must separately mark with the word "PROTECTED" every page, or portion thereof, that you redacted and claim as exempt from public disclosure pursuant to Section 11-35- 1810. All markings must be conspicuous; use color, bold, underlining, or some other method in order to conspicuously distinguish the mark from the other text.

(f) In determining whether to release documents, the District will detrimentally rely on your redaction and marking of documents, as required by these bidding instructions, as being either "Confidential" or "Trade Secret" or "Protected". By submitting a response, you agree to defend, indemnify and hold harmless the District, its officers and employees, from every claim, demand, loss, expense, cost, damage or injury, including attorney's fees, arising out of or resulting from withholding information by the District that you have redacted or marked as "Confidential" or "Trade Secret" or "Protected". (All references to S.C. Code of Laws.)

DRUG FREE WORK PLACE CERTIFICATION: By submitting an Offer, Contractor certifies that, if awarded a contract, Contractor will comply with all applicable provisions of The Drug-free Workplace Act, Title 44, Chapter 107 of the South Carolina Code of Laws, as amended.

ETHICS CERTIFICATE: By submitting an offer, the offeror certifies that the offeror has and will comply with, and has not, and will not, induce a person to violate Title 8, Chapter 13 of the South Carolina Code of Laws, as amended (ethics act). The following statutes require special attention: Section 8-13-700, regarding use of official position for financial gain; Section 8-13-705, regarding gifts to influence action of public official; Section 8-13-720, regarding offering money for advice or assistance of public official; Sections 8-13-755 and 8-13-760, regarding restrictions on employment by former public official; Section 8-13-775, prohibiting public official with economic interests from acting on contracts; Section 8-13-790, regarding recovery of kickbacks; Section 8-13-1150, regarding statements to be filed by consultants; and Section 8-13-1342, regarding restrictions on contributions by contractor to candidate who participated in awarding of contract. The district may rescind any contract and recover all amounts expended as a result of any action taken in violation of this provision. If contractor participates, directly or indirectly, in the evaluation or award of public contracts, including without limitation, change orders or task orders regarding a public contract, contractor shall, if required by law to file such a statement, provide the statement required by Section 8-13-1150 to the procurement officer at the same time the law requires the statement to be filed.

OPEN TRADE REPRESENTATION: By submitting an Offer, Offeror represents that the Offeror is not currently engaged in the boycott of a person or an entity based in or doing business with a jurisdiction with whom South Carolina can enjoy open trade, as defined SC Code Section 11-35-5300.

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DOCUMENT 002213 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

A. Instructions to Bidders for Project consist of the following:

1. AIA Document A701, "Instructions to Bidders."
2. The following Supplementary Instructions to Bidders that modify and add to the requirements of the Instructions to Bidders.

1.2 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, GENERAL

A. The following supplements modify AIA Document A701, "Instructions to Bidders." Where a portion of the Instructions to Bidders is modified or deleted by these Supplementary Instructions to Bidders, unaltered portions of the Instructions to Bidders shall remain in effect.

1.3 ARTICLE 2 - BIDDER'S REPRESENTATIONS

A. Add Section 2.1.3.1:

1. 2.1.3.1 - The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.

B. Add Section 2.1.5:

1. 2.1.5 - The Bidder is a properly licensed Contractor according to the laws and regulations of <**Insert name of jurisdiction**> and meets qualifications indicated in the Procurement and Contracting Documents.

C. Add Section 2.1.6:

1. 2.1.6 - The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

1.4 ARTICLE 3 - BIDDING DOCUMENTS

A. 3.2 - Interpretation or Correction of Procurement and Contracting Documents:

1. Add Section 3.2.2.1:

a. 3.2.2.1 - Submit Bidder's Requests for Interpretation using form furnished with electronic bid forms and submitted via email.

B. 3.4 - Addenda:

1. Delete Section 3.4.3 and replace with the following:

a. 3.4.3 - Addenda may be issued at any time prior to the receipt of bids.

2. Add Section 3.4.4.1:

a. 3.4.4.1 - Owner may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:

1) 3.4.4.1.1 - Information received as part of the Bid indicates that the Bid, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.

2) 3.4.4.1.2 - Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of Owner, affect the Contract Sum or Contract Time.

1.5 ARTICLE 4 - BIDDING PROCEDURES

A. 4.1 - Preparation of Bids:

1. Add Section 4.1.1.1:

a. 4.1.1.1 - Printable electronic Bid Forms and related documents are available from Architect.

2. Add Section 4.1.8:

a. 4.1.8 - The Bid shall include unit prices when called for by the Procurement and Contracting Documents. Owner may elect to consider unit prices in the determination of award. Unit prices will be incorporated into the Contract.

3. Add Section 4.1.9:

a. 4.1.9 - Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates or unit prices, failure to complete entries in all blanks in the Bid Form, or inclusion by the Bidder of any alternates, conditions, limitations or provisions not called for.

4. Add Section 4.1.10:

a. 4.1.10 - Bids shall include sales and use taxes. Contractors shall show separately with each monthly payment application the sales and use taxes paid by them and their subcontractors in the form indicated. Reimbursement of sales and use taxes, if any, shall be applied for by Owner for the sole benefit of Owner.

B. 4.3 - Submission of Bids:

1. Add Section 4.3.1.2:

a. 4.3.1.2 - Include Bidder's Contractor License Number applicable in Project jurisdiction on the face of the sealed bid envelope.

C. 4.4 - Modification or Withdrawal of Bids:

1. Add the following sections to 4.4.2:

a. 4.4.2.1 - Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Bidder. Authorized persons are those so identified in the Bidder's corporate bylaws, specifically empowered by the Bidder's charter or similar legally binding document acceptable to Owner, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to Owner at the time of seeking modifications or withdrawal of the Bid.

b. 4.4.2.2 - Owner will consider modifications to a bid written on the sealed bid envelope by authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added to or deducted from the Bid; the amount of the Bid itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed bid form, awaiting final figures from the Bidder, does not require power of attorney due to the evidenced authorization of the Bidder implied by the circumstance of the completion and delivery of the Bid.

D. 4.5 - Break-Out Pricing Bid Supplement:

1. Add Section 4.5:

a. 4.5 - Provide detailed cost breakdowns no later than two business days following Architect's request.

E. 4.6 - Subcontractors, Suppliers, and Manufacturers List Bid Supplement:

1. Add Section 4.6:

a. 4.6 - Provide list of major subcontractors, suppliers, and manufacturers furnishing or installing products no later than two business days following Architect's request. Include those subcontractors, suppliers, and manufacturers providing work totaling three percent or more of the Bid amount. Do not change subcontractors, suppliers, and manufacturers from those submitted without approval of Architect.

1.6 ARTICLE 5 - CONSIDERATION OF BIDS

A. 5.2 - Rejection of Bids:

1. Add Section 5.2.1:

a. 5.2.1 - Owner reserves the right to reject a bid based on Owner's and Architect's evaluation of qualification information submitted following opening of bids. Owner's evaluation of the Bidder's qualifications will include: status of licensure and record of compliance with licensing requirements, record of quality of completed work, record of Project completion and ability to complete, record of financial management including financial resources available to complete Project and record of timely payment of obligations, record of Project site management including compliance with requirements of authorities having jurisdiction, record of and number of current claims and disputes and the status of their resolution, and qualifications of the Bidder's proposed Project staff and proposed subcontractors.

1.7 ARTICLE 6 - POSTBID INFORMATION

A. 6.1 - Contractor's Qualification Statement:

1. Add Section 6.1.1:

a. 6.1.1 - Submit Contractor's Qualification Statement no later than two business days following Architect's request.

B. 6.3 - Submittals:

1. Add Section 6.3.1.4:

a. 6.3.1.4 - Submit information requested in Sections 6.3.1.1, 6.3.1.2, and 6.3.1.3 no later than two business days following Architect's request.

1.8 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 - Bond Requirements:

1. Add Section 7.1.1.1:

a. 7.1.1.1 - Both a Performance Bond and a Payment Bond will be required, each in an amount equal to 100 percent of the Contract Sum.

B. 7.2 - Time of Delivery and Form of Bonds:

1. Delete the first sentence of Section 7.2.1 and insert the following:
    a. The Bidder shall deliver the required bonds to Owner no later than 10 days after the date of Notice of Intent to Award and no later than the date of execution of the Contract, whichever occurs first. Owner may deem the failure of the Bidder to deliver required bonds within the period of time allowed a default.
2. Delete Section 7.2.3 and insert the following:
    a. 7.2.3 - Bonds shall be executed and be in force on the date of the execution of the Contract.

1.9 ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. <**Insert supplementary text**>.

1.10 ARTICLE 9 - EXECUTION OF THE CONTRACT

A. Add Article 9:
1. 9.1.1 - Subsequent to the Notice of Intent to Award, and within 10 days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner through Architect, in such number of counterparts as Owner may require.
2. 9.1.2 - Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.
3. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement[**or the date that the Bidder is obligated to deliver the executed Agreement and required bonds to Owner**].
4. 9.1.4 - In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to either award the Contract to the next responsible bidder or re-advertise for bids.

END OF DOCUMENT 002213

DOCUMENT 002513 - PREBID MEETINGS (STATED IN THE INVITATION/ADVERTISEMENT TO BID)

1.1 PREBID MEETING

A. Architect will conduct a Prebid meeting as indicated below:

1. Meeting Date: January 24, 2024.
2. Meeting Time: 10:00 a.m.
3. Location: Lancaster County School District Facilities, 1321 Springdale Road, Lancaster, SC 29720.

B. Attendance:

1. Prime Bidders: Attendance at Prebid meeting is recommended.
2. Subcontractors: Attendance at Prebid meeting is recommended.
3. Notice: Bids will only be accepted from prime bidders represented on Prebid Meeting sign-in sheet.

C. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:

1. Procurement and Contracting Requirements:
    a. Instructions to Bidders.
    b. Bidder Qualifications.
    c. Bonding.
    d. Insurance.
    e. Bid Security.
    f. Bid Form and Attachments.
    g. Bid Submittal Requirements.
    h. Bid Submittal Checklist.
    i. Notice of Award.
2. Communication during Bidding Period:
    a. Obtaining documents.
    b. Access to Project Web site.
    c. Bidder's Requests for Information.
    d. Bidder's Substitution Request/Prior Approval Request.
    e. Addenda.
3. Contracting Requirements:
    a. Agreement.
    b. The General Conditions.
    c. The Supplementary Conditions.
    d. Other Owner requirements.
4. Construction Documents:
    a. Scopes of Work.
    b. Temporary Facilities.
    c. Use of Site.
    d. Work Restrictions.
    e. Alternates, Allowances, and Unit Prices.
    f. Substitutions following award.
5. Separate Contracts:
    a. Work by Owner.

b. Work of Other Contracts.

6. Schedule:

   a. Project Schedule.
   b. Contract Time.
   c. Liquidated Damages.
   d. Other Bidder Questions.

7. Site/facility visit or walkthrough.
8. Post-Meeting Addendum.

END OF DOCUMENT 002513

DOCUMENT 002600 - PROCUREMENT SUBSTITUTION PROCEDURES

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing by prime contract Bidder only in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
2. Submittal Format: Submit three copies of each written Procurement Substitution Request, using form bound in Project Manual.
3. Submittal Format: Submit Procurement Substitution Request, using format provided on Project Web site.

    a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
    b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:

        1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
        2) Copies of current, independent third-party test data of salient product or system characteristics.

3) Samples where applicable or when requested by Architect.
4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from ICC-ES.
7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.

c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 002600

DOCUMENT 004113 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: Lancaster HS Baseball Restrooms.

C. Project Location: 325 Woodland Drive, Lancaster, SC 29720.

D. Owner: Lancaster County School District.

E. Architect: Allen Taylor.

F. Architect Project Number: 2201-231926.

1.2 CERTIFICATIONS AND BASE BID

A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by LS3P Associates LTD. and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

1. _____ Dollars ($_____).
2. The above amount may be modified by amounts indicated by the Bidder on the attached Document 004322 "Unit Prices Form" and Document 004323 "Alternates Form."

1.3 BID GUARANTEE

A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 60 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:

1. _____ Dollars ($_____).

B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

1.4 SUBCONTRACTORS AND SUPPLIERS

A. The following companies shall execute subcontracts for the portions of the Work indicated:

1. Concrete Work: _____.
    a. Company Name: _____.
    b. S.C. License #: _____.
2. Masonry Work: _____.
    a. Company Name: _____.

b. S.C. License #: _____.

3. Roofing Work: _____.

a. Company Name: _____.
b. S.C. License #: _____.

4. Plumbing Work: _____.

a. Company Name: _____.
b. S.C. License #: _____.

5. HVAC Work: _____.

a. Company Name: _____.
b. S.C. License #: _____.

6. Electrical Work: _____.

a. Company Name: _____.
b. S.C. License #: _____.

1.5 TIME OF COMPLETION

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Architect, and shall fully complete the Work by:

1. Substantial Completion: TBD
2. Final Completion: TBD.

1.6 ACKNOWLEDGEMENT OF ADDENDA

A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

1. Addendum No. 1, dated _____.
2. Addendum No. 2, dated_____.

1.7 BID SUPPLEMENTS

A. The following supplements are a part of this Bid Form and are attached hereto.

1. Bid Form Supplement - Alternates.
2. Bid Form Supplement - Unit Prices.
3. Bid Form Supplement - Bid Bond Form (AIA Document A310-2010).

1.8 CONTRACTOR'S LICENSE

A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in Lancaster County, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

1.9 SUBMISSION OF BID

A. Respectfully submitted this ____ day of _____, 2024.

B. Submitted By:_____(Name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

F. Witnessed By:_____(Handwritten signature).

G. Attest:_____(Handwritten signature).

H. By:_____(Type or print name).

I. Title:_____(Corporate Secretary or Assistant Secretary).

J. Street Address:_____.

K. City, State, Zip:_____.

L. Phone:_____.

M. License No.:_____.

N. Federal ID No.:_____(Affix Corporate Seal Here, Inked or Electronic).

END OF DOCUMENT 004113

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DOCUMENT 004313 - BID SECURITY FORMS

1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form.

1.2 BID BOND FORM

A. AIA Document A310-2010 "Bid Bond" is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.

B. Copies of AIA standard forms may be obtained from The American Institute of Architects; https://www.aiacontracts.org/; email: docspurchases@aia.org; (800) 942-7732.

END OF DOCUMENT 004313

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DOCUMENT 004321 - ALLOWANCE FORM

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: Lancaster HS Baseball Restrooms.

C. Project Location: 325 Woodland Drive, Lancaster, SC 29720.

D. Owner: Lancaster County School District.

E. Architect: LS3P Associates LTD.

F. Architect Project Number: 2201-231926.

1.2 BID FORM SUPPLEMENT

A. This form is required to be attached to the Bid Form.

B. The undersigned Bidder certifies that Base Bid submission to which this Bid Supplement is attached includes those allowances described in the Contract Documents and scheduled in Section 012100 "Allowances."

1.3 SUBMISSION OF BID SUPPLEMENT

A. Respectfully submitted this ____ day of _____, 2024.

B. Submitted By:_____(Insert name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

END OF DOCUMENT 004321

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DOCUMENT 004373—PROPOSED SCHEDULE OF VALUES FORM

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.

END OF DOCUMENT 004373

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DOCUMENT 004393 - BID SUBMITTAL CHECKLIST

1.1 BID INFORMATION

A. Bidder: _____.

B. Prime Contract: _____.

C. Project Name: Lancaster HS Baseball Restrooms.

D. Project Location: 325 Woodland Drive, Lancaster, SC 29720.

E. Owner: Lancaster County School District.

F. Architect: Tyler McKenzie, tylermckenzie@ls3p.com.

G. Architect Project Number: 2201-231926.

1.2 BIDDER'S CHECKLIST

A. In an effort to assist the Bidder in properly completing all documentation required, the following checklist is provided for the Bidder's convenience. The Bidder is solely responsible for verifying compliance with bid submittal requirements.

B. Attach this completed checklist to the outside of the Submittal envelope.

1. Used the Bid Form provided in the Project Manual.
2. Prepared the Bid Form as required by the Instructions to Bidders.
3. Indicated on the Bid Form the Addenda received.
4. Attached to the Bid Form: Bid Supplement Form - Allowances.
5. Attached to the Bid Form: Proposed Schedule of Values Form.
6. Attached to the Bid Form: Bid Bond OR a certified check for the amount required.
7. Bid envelope shows name and address of the Bidder.
8. Bid envelope shows the Bidder's Contractor's License Number.
9. Bid envelope shows name of Project being bid.
10. Bid envelope shows name of Prime Contract being bid, if applicable.
11. Bid envelope shows time and day of Bid Opening.
12. Verified that the Bidder can provide executed Performance Bond and Labor and Material Bond.
13. Verified that the Bidder can provide Certificates of Insurance in the amounts indicated.

END OF DOCUMENT 004393

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SECTION 006000 - PROJECT FORMS

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:

1. AIA Document A101-2017 "Standard Form of Agreement between Owner and Contractor Where the Basis of Payment is a Stipulated Sum."

a. The General Conditions for Project are AIA Document A201-2017 "General Conditions of the Contract for Construction."

2. The General Conditions are incorporated by reference.
3. The Supplementary Conditions for Project are incorporated into a modified copy of the General Conditions included in the Project Manual.

1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; www.aiacontractdocsaiacontracts.org; (800) 942-7732.

C. Preconstruction Forms:

1. Form of Performance Bond and Labor and Material Bond: AIA Document A312-2010 "Performance Bond and Payment Bond."
2. Form of Certificate of Insurance: AIA Document G715-2017 "Supplemental Attachment for ACORD Certificate of Insurance 25."

D. Information and Modification Forms:

1. Form for Requests for Information (RFIs): AIA Document G716-2004 "Request for Information (RFI)."
2. Form of Request for Proposal: AIA Document G709-2018 "Proposal Request."
3. Change Order Form: AIA Document G701-2017 "Change Order."
4. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G710-2017 "Architect's Supplemental Instructions."
5. Form of Change Directive: AIA Document G714-2017 "Construction Change Directive."

E. Payment Forms:

1. Schedule of Values Form: AIA Document G703-1992 "Continuation Sheet."
2. Payment Application: AIA Document G702-1992/703-1992 "Application and Certificate for Payment and Continuation Sheet."
3. Form of Contractor's Affidavit: AIA Document G706-1994 "Contractor's Affidavit of Payment of Debts and Claims."
4. Form of Affidavit of Release of Liens: AIA Document G706A-1994 "Contractor's Affidavit of Payment of Release of Liens."
5. Form of Consent of Surety: AIA Document G707-1994 "Consent of Surety to Final Payment."

END OF SECTION 006000

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DOCUMENT 006325 – REQUEST FOR SUBSTITUTION FORM

Project:	Lancaster HS Baseball Restroom	Project No.:	2201-231926
To:	LS3P Associates LTD	Specification Section	
	701-A Lady Street		
	Columbia, SC 29201	Contractor:	
Attn.:	Allen Taylor	Requested by:	
Phone:	803-765-2418	Phone:	
Fax:		Fax:	
Email:	allentaylor@ls3p.com	Email:	

Reason for not providing specified item:

Savings to Owner for accepting substitution:

Specified Product/Fabrication Method
(List name/description; model no.; manufacturer):

Required Information for ***Specified*** Product:	Attached:
Point by Point Comparative Product Data	☐
Tests	☐
Reports	☐
Fabrication Drawings	☐
Samples (Where Applicable)	☐

Proposed Product/Fabrication Method
(List trade name/description; model no.; manufacturer) :

Required Information for ***Proposed*** Product:	Attached:
Point by Point Comparative Product Data	☐ (Required)
Tests	☐
Reports	☐
Fabrication Drawings	☐
Samples (Where Applicable)	☐

List of Related Changes/Modifications:

Differences between proposed substitution and specified product: _____

_____

_____

Proposed product/fabrication method affects other parts of the Work ☐ No ☐ Yes: Explain _____

_____

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product as utilized for this project, except as noted herein.
- Qualifications of manufacturer, installer, and other specified parties meet the specified qualifications.
- Same special warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source for replacement parts, as applicable, is available as that specified.
- Proposed substitution does not affect dimensions and functional clearances, except as noted herein.
- Proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
- Failure of proposed substitution to produce indicated results will not be considered grounds for additional payment or time.

For the Contractor: _____

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

For the Manufacturer:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

END OF DOCUMENT 006325

SECTION 011000 - 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. Owner-furnished/Contractor-installed (OFCI) products.
4. Owner-furnished/Owner-installed (OFOI) products.
5. Contractor's use of site and premises.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and Drawing conventions.

1.3 PROJECT INFORMATION

A. Project Identification: Lancaster HS Baseball Restroom| Project Number: 2201-231926.

1. Project Location: 325 Woodland Drive, Lancaster, SC 29720.

B. Owner: Lancaster County School District | 300 South Catawba Street, Lancaster, SC 29720.

1. Owner's Representative: Tim Bowers | tim.bowers@lcsd.k12.sc.us>.

C. Architect: LS3P, 701-A Lady Street, Columbia, SC 29201; Phone: 803.765.2418.

1. Architect's Representative: Tyler McKenzie, AIA | tylermckenzie@ls3p.com.

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Civil Engineering : Campco Engineering, Inc..
    a. Civil Engineering Representative: Michael Fry | mfry@campcoengineering.com.
2. Structural Engineering: Cranston Engineering Group, P.C.
    a. Structural Engineering Representative: Eric Pinto | epinto@cranstonengineering.com

E. Other Owner Consultants: Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Mechanical, Electrical and Plumbing Engineering: MECA, Inc.:
    a. Mechanical, Electrical and Plumbing Representative: Gene Wilson | genewilson@mecainc.com.

F. Project Information Management System: Project software will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination." for requirements for using Project Information Management System.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Work required for this project includes a new single-story building of Type IIB construction with Group U occupancy. Major construction systems include slab-on-grade floors, concrete masonry load bearing exterior walls, single ply EPDM roofing membrane on rigid foam board insulation on wood decking. Exterior doors and frames are hollow metal with fixed louver transoms and interior doors are phenolic on hollow metal frames. Interior finishes include sealed concrete floors, paint, and hard gypsum ceilings. Site work and other Work indicated in the Contract Documents will be required.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.
    a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

A. Restricted Use of Site: Each Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.7 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.8 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 all 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 scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

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 administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Unit-cost allowances.

C. Related Requirements:

1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu 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.

1.4 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 UNIT-COST ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight,and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs due to a change in the scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include 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 the Contract Documents.
2. No change to 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Unit-Cost Allowance: Include the sum, of a “to be determined” amount, per door leaf as specified in Section 087100 "Door Hardware" and as shown on Drawings.

1. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

END OF SECTION 012100

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SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience (Not Allowed): Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.

i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance:

1) During Bid Phase: Addenda.
2) During Construction: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.

c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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DOCUMENT 012500.1 – CONTRACTOR'S REQUEST FOR SUBSTITUTION FORM

Project:	Lancaster HS Baseball Restroom	Project No.:	2201-231926
To:	LS3P Associates LTD.	Specification Section #:	
	701 Lady St. #A, Columbia, SC 29201	Contractor:	
Attn.:	Tyler McKenzie	Requested by:	
Phone:	803-765-2418	Phone:	
Fax:	704-333-9926	Fax:	
Email:	tylermckenzie@ls3p.com	Email:	

Reason for not providing specified item:

Savings to Owner for accepting substitution:

Specified Product/Fabrication Method
(List name/description; model no.; manufacturer):

Required Information for ***Specified*** Product:	Attached:
Point by Point Comparative Product Data	☐
Tests	☐
Reports	☐
Fabrication Drawings	☐
Samples (Where Applicable)	☐

Proposed Product/Fabrication Method
(List trade name/description; model no.; manufacturer) :

Required Information for ***Proposed*** Product:	Attached:
Point by Point Comparative Product Data	☐ (Required)
Tests	☐
Reports	☐
Fabrication Drawings	☐
Samples (Where Applicable)	☐

List of Related Changes/Modifications:

Differences between proposed substitution and specified product:

Proposed product/fabrication method affects other parts of the Work ☐ No ☐ Yes: Explain

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product as utilized for this project, except as noted herein.
- Qualifications of manufacturer, installer, and other specified parties meet the specified qualifications.
- Same special warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source for replacement parts, as applicable, is available as that specified.
- Proposed substitution does not affect dimensions and functional clearances, except as noted herein.
- Proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
- Failure of proposed substitution to produce indicated results will not be considered grounds for additional payment or time.

For the Contractor:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

For the Manufacturer:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

END OF CONTRACTOR'S REQUEST FOR SUBSTITUTION FORM

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.2 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.

1.3 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.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 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.
    a. 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.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated 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.
    e. Quotation Form: Use forms acceptable to Architect or form provided as part of web-based Project management software.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to 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. Include costs of labor and supervision directly attributable to the change.
5. Include an updated 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.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect or form provided as part of web-based Project management software.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs 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.

1.6 EXTENSION OF TIME DUE TO WEATHER

A. General: This article establishes conditions and procedures for amending the Contract Time when excess adverse weather conditions have repeatedly caused cancellation of schedule critical activities, resulting in delay to the Project.

B. Definitions:

1. Adverse Weather: Job site environmental conditions in which precipitation, or soil conditions resulting from precipitation, or ambient temperature conditions during working hours preclude carrying out a Scheduled Critical Activity. The following

conditions may be considered by the Architect in determining the extent of excess adverse weather conditions, depending upon the nature of the delayed project tasks:

a. Precipitation greater than 0.1 inch of water equivalent per day.
b. Days on which the average air temperature does not exceed 40 degrees F.
c. Other weather conditions deemed hazardous by the Contractor.

2. Scheduled Critical Activity: Project tasks, the delay of which will directly result in a delay in the completion of the project.
3. Excess Adverse Weather: Adverse weather occurring in excess of the normal, cumulative number of calendar days of adverse weather as listed below:

Month	Normal	Month	Normal
January	6	July	7
February	6	August	7
March	6	September	5
April	5	October	4
May	5	November	4
June	7	December	6
		Total Annual	67

C. Claim for Extension of Time Due to Weather:

1. Contractor shall file claim for each month during which adverse weather occurs.
   a. Attach copies of Contractor's Daily Reports for each day of adverse weather, describing fully the weather conditions, schedule activities delayed, and reasons for the delay.
   b. Include photographs where applicable for documenting soil conditions.
2. Claim shall be filed for a calendar month by attaching the completed form to the Application for Payment submitted the following month.
3. Architect shall review and approve or take other action upon Contractor's Claim for Extension of Time. Adjustment of Contract Time shall be made by a single Change Order prepared at project closeout.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

1.2 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.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use 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. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Owner's name.
c. Owner's Project number.
d. Name of Architect.
e. Architect's Project number.
f. Contractor's name and address.
g. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. 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.
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 of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

1) Labor.
2) Materials.
3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. 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.

6. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
7. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and Construction Manager and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.

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.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

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: Submit three signed and notarized original copies of each Application for Payment to Architect Construction Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Sustainable design action plans, including preliminary project materials cost data.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.

13. Initial progress report.
14. Report of preconstruction conference.

I. Subsequent Application for Payment: After issuing the Initial Application for Payment, administrative actions and submittals that must precede or coincide with submittal of remaining Applications for Payment include the following:

1. Reports and other documents indicated in Division 01 Section "Construction Progress Documentation."
2. Closeout Submittal List (preliminary, if not final).

J. Retainage Reduction:

1. Owner shall pay the amount due to the Contractor on account of progress payments as indicated in the Agreement. After completion of a percentage of the Work, as agreed, the Contractor shall submit, for Owner's and Architect's review and approval a written request for retainage reduction. Upon Owner's approval, with written consent of the surety, the Architect may certify remaining partial payments to be paid in full.
2. The Contractor, as a condition precedent to retainage reduction shall submit, for review and approval by the Architect, the required O&M manual.

K. Application for Payment at Substantial Completion : After Architect issues 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.
    a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

L. Final Payment Application: After completing Project closeout requirements, 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.
6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Project Information Management System.
5. Project meetings.

B. Related Requirements:

1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Prior to 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, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

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 assure proper performance of components, 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 to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. 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 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. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to the following requirements:

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on 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 dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
2. Review: Architect will review coordination drawings to verify that components requiring coordination have been included, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
3. Coordination Drawing Format: Prepare coordination drawings according to requirements in Section 013300 "Submittal Procedures" for Shop Drawings and post to Project Information Management System.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Review: Architect will review coordination drawings to verify that components requiring coordination have been included, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

1.6 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI via the Project Information Management System.
    1. Architect will not respond to those RFIs submitted to Architect by other entities controlled by Contractor.
    2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
    1. Specification Section number and title and related paragraphs, as appropriate.
    2. Drawing number and detail references, as appropriate.
    3. Field dimensions and conditions, as appropriate.

4. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
5. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will not be reviewed:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Architect's actions on submittals.
f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

D. RFI Log: The Project Information Management System will create and maintain the RFI log.

E. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.7 WEB-BASED PROJECT INFORMATION MANAGEMENT SYSTEM

A. The Architect has established a web-based Project Information Management System to facilitate communication and record-keeping during the project. Architect will provide access to Contractor's key personnel. Refer to www.NewForma.com.

1. Use Architect's web-based Project Information Management System for purposes of managing project communication and documentation until Final Completion.
2. Due to the size restrictions on email communication, all electronic files must be submitted through the Project Information Management System. Architect assumes no responsibility for information not received or retrieved by Contractor's failure to use the Project Information Management System and such loss or delay of information will not be considered as a delay claim.

B. The Project Information Management System shall include the following:

1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.

6. Submittal forms and logs.
7. Reminder and tracking functions.
8. Task and issue management.
9. Photo documentation.
10. Schedule and calendar management.
11. Payment application forms.
12. Drawing and specification document hosting, viewing, and updating.
13. Online document collaborations.
14. Archiving function.

C. Contractor, subcontractors, and other parties granted access by Contractor to Project Information Management System shall execute a data licensing agreement in the Form of Agreement included in this Project Manual.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record discussions and agreements achieved. Distribute the meeting minutes to attendees, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, Architect and Contractor.

1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. 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. Critical work sequencing and long lead items.
    c. Designation of key personnel and their duties.
    d. Procedures for processing field decisions and Change Orders.
    e. Procedures for RFIs.
    f. Procedures for testing and inspecting.
    g. Procedures for processing Applications for Payment.
    h. Distribution of the Contract Documents.
    i. Submittal procedures.
    j. Preparation of Record Documents.
    k. Use of the premises.
    l. Work restrictions.
    m. Working hours.
    n. Owner's occupancy requirements.
    o. Responsibility for temporary facilities and controls.
    p. Procedures for moisture and mold control.
    q. Procedures for disruptions and shutdowns.
    r. Construction waste management and recycling.

s. Parking availability.
t. Office, work, and storage areas.
u. Equipment deliveries and priorities.
v. First aid.
w. Security.
x. Progress cleaning.
y. Bonds and insurance.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for 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 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. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts and material compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written instructions.
m. Warranty requirements.
n. Acceptability of substrates.
o. Temporary facilities and controls.
p. Space and access limitations.
q. Regulations of authorities having jurisdiction.
r. Testing and inspecting requirements.
s. Installation procedures.
t. Coordination with other work.
u. Required performance results.
v. Protection of adjacent work.
w. Protection of construction and personnel.

3. Record conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
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.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of Record Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Procedures for completing and archiving web-based Project software site data files.
    d. Submittal of written warranties.
    e. Requirements for completing sustainable design documentation.
    f. Requirements for preparing operations and maintenance data.
    g. Requirements for delivery of material samples, attic stock, and spare parts.
    h. Requirements for demonstration and training.
    i. Preparation of Contractor's punch list.
    j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    k. Submittal procedures.
    l. Coordination of separate contracts.
    m. Owner's partial occupancy requirements.
    n. Installation of Owner's furniture, fixtures, and equipment.
    o. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at monthly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner 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 meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. 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 present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Status of sustainable design documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of 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.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's 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.

F. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner 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 meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined 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.
b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.

3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site use.
9) Temporary facilities and controls.
10) Work hours.
11) Hazards and risks.
12) Progress cleaning.
13) Quality and work standards.
14) Status of RFIs.
15) Proposal Requests.
16) Change Orders.
17) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013300 - 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 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 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 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, 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.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.

16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. 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 on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

A. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings may be available from Architect for Contractor's use in preparing submittals.

1. The digital data files are available under the following conditions:

a. Contractor shall execute a data licensing agreement in the form of Digital Data Letter of Agreement.
b. Digital data drawings are not to be considered Contract Documents as defined by the General Conditions for the Contract for Construction.
c. The Contract Documents executed or identified in the Owner/Contractor Agreement, shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers.
d. The Contractor shall not transfer or reuse Instruments of Service in electronic or machine-readable form without the prior written consent of the 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.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect'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 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect 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 15 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

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 action stamp.

1.6 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 before Shop Drawings, and before or concurrently with Samples.

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.

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.

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. Product name and name of manufacturer.
    c. Number and title of applicable Specification Section.
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 of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect 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 two sets of Samples. Architect will retain one Sample sets; remainder will be returned.
        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. 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.

E. 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.

F. 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.

G. 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.

1.7 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 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.

1.8 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.

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 will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action , as follows:

a. No Exceptions Taken: The work covered by the submittal may proceed.
b. Note Markings: The work covered by the submittal may proceed provided it complies with both the Architect’s notations and corrections on the submittal and the Contract Documents.
c. Rejected: Do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the contract document.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

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LS3P ARCHITECTURE ▪ INTERIORS ▪ PLANNING

DIGITAL DATA LETTER OF AGREEMENT

An Agreement between LS3P ASSOCIATES LTD. (the "Architect") and ___ (the "Licensee," either Original or Third Party, as the case may be) for Licensing of Digital Data

Architect: LS3P ASSOCIATES LTD.
701 Lady Street #A
Columbia, SC 29201
Contact: Tyler McKenzie
(tylermckenzie@ls3p.com)

Licensee:
Original __
3rd Party __

Project No.: **2201-231926**
Project Name: **Lancaster HS Baseball Restroom**
Location: Lancaster, SC
Date: _____

The Architect will provide the following Digital Data, dated as of the particular transmission, to the Licensee **for information purposes only:**

Sheet XXX (.dwg format)
Sheet XXX (.dwg format)
Sheet XXX (.dwg format)
Sheet XXX (.dwg format)

Digital Data was prepared using the following:

Software: AutoCAD (.dwg) **Version:**

Digital Data to be delivered via the following media: Newforma Website posting

Licensee shall pay the Architect a service fee of $30.00 and other good and valuable consideration.

TERMS AND CONDITIONS

1. The Architect and its consultants make no representation as to the compatibility of the Digital Data with any hardware or software. The Licensee shall notify the Architect within five (5) business days of any problems associated with accessing and/or using the Digital Data.

2. The Licensee acknowledges and agrees that the Digital Data may change or degrade during the transmission process. The Licensee acknowledges and agrees that the Architect and its consultants may remove all indications of ownership from the Digital Data prior to transmission.

3. All Digital Data shall be considered the property of the Architect and/or its consultants and shall not be used for other Projects, for additions to this Project without the prior written permission of the Architect and/or its consultants. Digital Data shall not be re-transmitted by the Original Licensee to a Third-Party Licensee without prior execution of an agreement identical to this Agreement between the Architect, the Original Licensee, and the Third-Party Licensee. Under no circumstances shall the transmission of the Digital Data be considered a sale of goods or a sale of copyrights.

4. **THE ARCHITECT AND THE ARCHITECT'S CONSULTANTS HEREBY EXPRESSLY DISCLAIM ANY AND ALL WARRANTIES, BOTH EXPRESS AND IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AS WELL AS ANY WARRANTY OF ACCURACY, COMPLETENESS, AND/OR PERMANENCE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.** Addenda information and/or revisions made to the most current Digital Data after any date of transmission have not been incorporated into the transmitted Digital Data. In the event of a conflict between the Architect's printed instruments of service (2D Documents) whether sealed or unsealed) and the Digital Data (3D Model), the printed instruments of service shall govern. The Licensee acknowledges and agrees that the duty to determine the existence of any and all conflicts between the Digital Data and any other information upon which the Licensee relies rests solely upon the Licensee. The Digital Data shall not be considered Contract Documents or Construction Documents as defined by any General Conditions of Contract for Construction. The Digital Data is being provided for information only and on a strictly "AS IS" basis.

5. Licensee agree the extent of its reliance on any Digital Data shall be limited to the uses identified in this Agreement.

6. Licensee may use and rely upon the Digital Data only for programming, site analysis, design review, 3D coordination of structural, mechanical, plumbing, and electrical systems, and preconstruction activities.

7. The Level of Development (LOD) describes the minimum dimensional, spatial, quantitative, qualitative, and other data included in the Digital Data to support the uses and reliance included in this Agreement. The LOD of the Digital Data transmitted is LOD 200. LOD 200 is defined as model and model elements that are generically and graphically represented within the Digital Data with approximate quantity of major components, size, shape, location, and orientation.

8. If Licensee discovers or becomes aware of any discrepancies, inconsistencies, errors, or omissions in any Digital Data transmitted, they shall promptly report the discrepancy, inconsistency, error, or omission in writing to the Architect. Licensee shall not use any discrepancy, inconsistency, error, or omission in the Digital Data as the basis of a claim.

9. Any reliance on the Digital Data not in accordance with this Agreement shall be at the sole risk of the Licensee.

10. The use and/or provision of the Digital Data prepared by the Architect and/or its consultants shall not in any way reduce or obviate the Licensee's duty to check and coordinate dimensions, details, and quantities of materials as required to facilitate construction of the Project in a complete and quality manner consistent with the applicable standards of care. Confirmation of existing conditions is the sole responsibility of the Licensee.

11. The Licensee agrees to the extent permitted by applicable law, to indemnify, hold harmless, and release the Architect and/or its consultants, their officers, shareholders, employees, and sub-consultants from any and all injuries, claims, demands, expenses, suits, liabilities, losses, damages, costs, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses related to the Digital Data, including but not limited to, attorneys' fees, expert witness fees, and court costs arising out of or in any way related to or connected with any negligent act and/or omission in the generation, provision, and/or use of the Digital Data by the Licensee and/or any of its subcontractors, suppliers, and/or consultants and waive any and all rights to such claims and causes of action.

12. The Licensee waives damages against the Architect for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, and/or claim expenses arising out of or relating to this Agreement and/or generation, provision, and/or use of the Digital Data, including, but not limited to, consequential damages and reasonable attorneys' fees and defense costs.

13. The Architect's and/or the Architect's consultants' liability to the Licensee and/or any of its subcontractors, suppliers, and/or consultants for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses arising out of or relating to this Agreement and/or the Digital Data, including, but not limited to, reasonable attorneys' fees and defense costs, regardless of the nature of the claim or damage, shall not exceed, either individually or in the aggregate, the total amount of $1,000.00. Such causes include, but are not limited to, the Architect's and/or the Architect's consultants' negligence, errors, omissions, strict liability, breach of contract, and/or breach of warranty.

14. To the best of the Architect's knowledge, information and belief, there are no licensing or copyright fees due to others based on the transmission of the Digital Data, but to the extent that such unknown fees do exist, the Licensee agrees to pay the required fees and hold the Architect and/or its consultants harmless from any associated costs or penalties.

15. Upon execution of this Agreement, the Architect grants to the Licensee a non-exclusive, non-transferable (except as set forth herein), limited license to use the Digital Data solely and exclusively for informational purposes on the identified Project only, provided that the Licensee substantially performs its obligations under this Agreement.

16. Any purchase order number provided by the Licensee is for the Licensee's accounting purposes only. The Licensee acknowledges and agrees that purchase order terms and conditions are null, void, and inapplicable to this Agreement.

17. This Agreement constitutes the entire agreement between the parties relative to the Digital Data and shall be governed by the laws of the State of <**South Carolina**> <**North Carolina**><**Georgia**> <**OTHER STATE**> without regard to principles of conflicts of law.

AUTHORIZED ACCEPTANCE

by Architect:
LS3P ASSOCIATES LTD.

_____
Signature

_____
Print Name and Title

_____
Date

by Original Licensee:

_____
Signature

_____
Print Name and Title

_____
Date

by Third Party Licensee:
_____

_____
Signature

_____
Print Name and Title

_____
Date

WE SO CONSENT:

by Owner:
_____

_____
Signature

_____
Print Name and Title

_____
Date

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

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.

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).

D. Mockups: 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.

E. 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.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to 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.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

H. 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."

I. 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.

J. 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.

1.3 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 not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. 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.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements,

indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. 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.

1.6 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.7 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

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. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. 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.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. 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.

I. 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.

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 Contractor's responsibilities, including the following:

1. Provide test specimens representative of proposed products and construction.
2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
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, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
    a. Allow seven days for initial review and each re-review of each mockup.
6. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
7. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
8. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
9. Demolish and remove mockups when directed unless otherwise indicated.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of 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.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Engage a qualified testing agency to perform quality-control services.
    a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as

possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms, including "requested," "authorized," "selected," "required," and "permitted," have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms, including "shown," "noted," "scheduled," and "specified," have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 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.

1.3 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."

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. ICC - International Code Council; www.iccsafe.org.
2. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

C. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the DOJ's "2017 ADA Standards for Accessible Design" and ICC A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices:

1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Conference room of sufficient size to accommodate meetings of 20 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
2. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
3. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. 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 nonabsorbent material.

C. HVAC Equipment: Unless Owner authorizes use of permanent HVAC 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. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service:

1. Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Electric Power Service:

1. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
    a. Install electric power service underground unless otherwise indicated.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
2. Utilize designated area within existing building for temporary field offices.
3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. 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 in accordance with Section 312000 "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, 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 in accordance with Section 321216 "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: parking areas for construction personnel.

F. Storage and Staging: Use designated areas of Project site for storage and staging needs.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs, so they are legible at all times.

I. Waste Disposal Facilities:

1. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
2. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 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.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control:

1. Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
2. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, in accordance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

a. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
b. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
c. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
d. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection:

1. Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
2. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

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 incomplete, insulate temporary enclosures.

J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -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.

4. Provide temporary standpipes and hoses for fire protection. 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.

3.5 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

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.

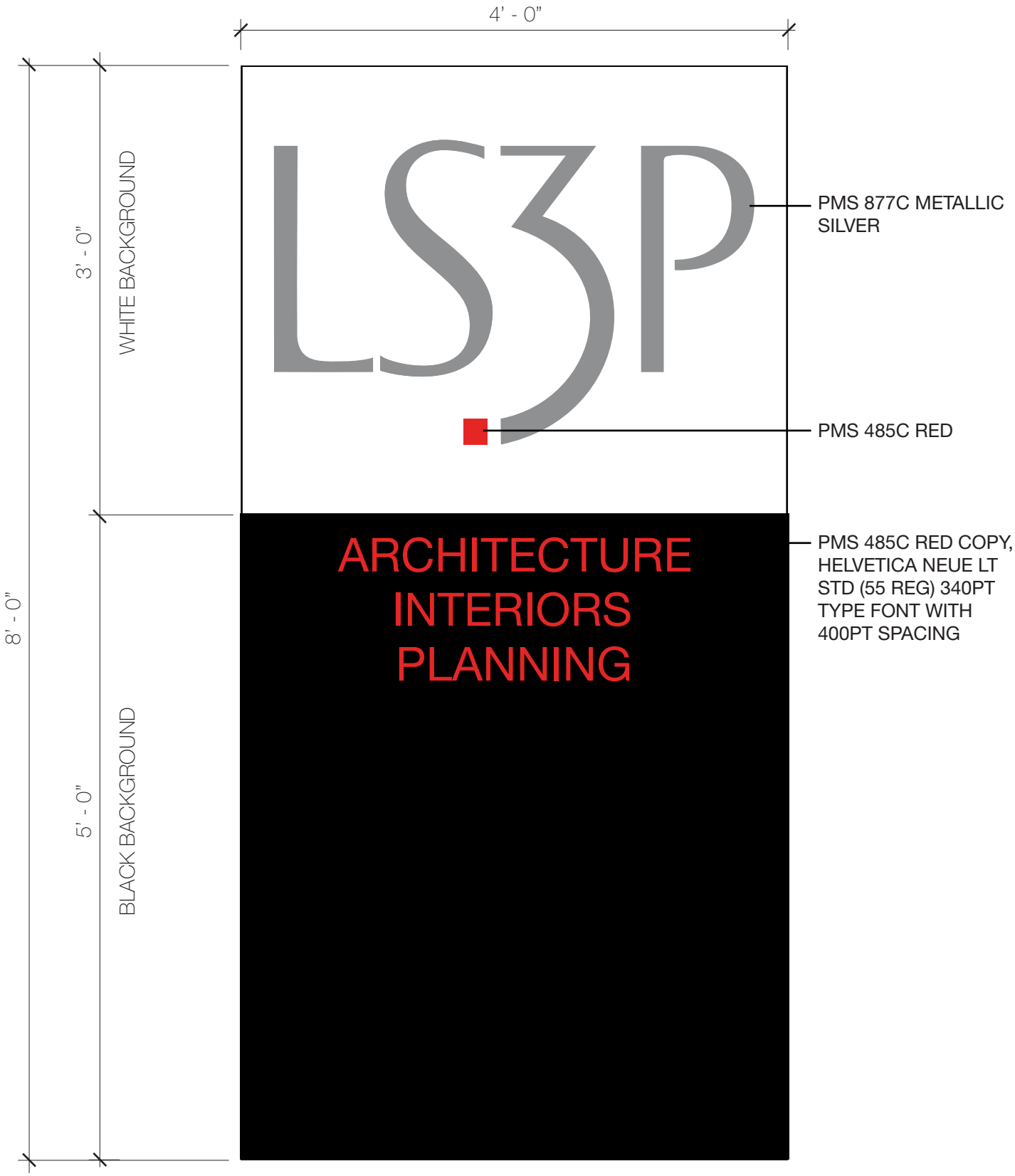
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: 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 property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000



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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

A. Products: Items obtained 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 or model number 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 incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: 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.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Resolution of Compatibility Disputes between Multiple Contractors:

a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.4 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections 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 Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to 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 in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: 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, finish, fasteners, and other items needed for a complete installation and indicated 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 the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

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 012500 "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, as specified in Section 013300 "Submittal Procedures."

1. Form of Approval of Submittal: As specified in Section 013300 "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: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Coordination of Owner's portion of the Work.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

1.2 PREINSTALLATION MEETINGS

A. Layout Conference: Conduct conference at Project site.

1. Prior to establishing layout of new building perimeter, review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:

a. Contractor's superintendent.
b. Professional surveyor responsible for performing Project surveying and layout.

2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certified Surveys: Submit two copies signed by land surveyor.

C. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.

1.4 CLOSEOUT SUBMITTALS

A. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: 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.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: 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, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and 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 appurtenances located 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. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.

B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.

5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

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.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. 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 aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

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 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.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

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 the 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, in accordance with regulations.
    a. Use containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces in accordance with written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. 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.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Recycling nonhazardous demolition and construction waste.
2. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.

C. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Contractor is encouraged to recycle as much nonhazardous construction waste as practical, without incurring additional costs to the Owner.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.3 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

END OF SECTION 017419

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final Completion procedures.
3. Submittal of Project warranties.
4. Final cleaning.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest-control inspection.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.

5. Submit testing, adjusting, and balancing records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list will state that 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.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection

or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in the following format:

    a. MS Excel Electronic File: Architect will return annotated file.
    b. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

1.7 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit by uploading to web-based project software site.

D. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

   a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   f. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   g. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
   h. Vacuum and mop concrete.
   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean in accordance with manufacturer's instructions if visible soil or stains remain.
   j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
   k. Remove labels that are not permanent.
   l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
   m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
   n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
   o. Clean ducts, blowers, and coils.

      1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.

p. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
q. Clean strainers.
r. Leave Project clean and ready for occupancy.

3.2 CORRECTION OF THE WORK

A. Complete repair and restoration operations required by "Correction of the Work" Article in Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
2. Submit three paper copies of final manual.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.5 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.7 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. 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.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. 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.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.

4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.

B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal:

1) Submit PDF electronic files of scanned record prints and one set of file prints.
2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit PDF electronic files of scanned Record Prints and one set of file prints.
2) Print each drawing, whether or not changes and additional information were recorded.

c. Engineered Systems: For Manufacturer/Contractor engineered systems, i.e. fire protection systems, light gauge framing systems, panelized systems, etc., Contractor shall submit two sets of security protected record drawings as follows:

1) One in *.DWG or acceptable CAD format (write protected).
2) One in *.PDF format, with seals and signatures.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.

c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."

d. Name of Architect.
e. Name of Contractor.

1.4 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator and instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.5 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.

k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.6 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.7 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

SECTION 024113 - SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. Demolition and removal of structures.
2. Demolition and removal of site improvements.
3. Disconnecting, capping or sealing, and abandoning site utilities in place.
4. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section “Cutting and Patching” for cutting and patching procedures for demolition operations.
2. Division 01, Section “Construction Progress Documentation” for demolition schedule requirements.
3. Division 01, Section “Temporary Facilities and Controls” for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for demolition operations.
4. Division 01, Section "Closeout Procedures" for record document requirements.
5. Division 31, Section "Site Clearing" for site clearing and removing above- and below-grade improvements.
6. Division 31, Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.2 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed

to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.4 SUBMITTALS

A. Record drawings at Project closeout according to Division 01, Section "Closeout Procedures."

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Asbestos: It is not expected that asbestos will be encountered in the course of this Contract. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Architect and the Owner.

1. Asbestos will be removed by Owner before start of Work.

B. Storage or sale of removed items or materials on-site will not be permitted.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.2 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.

a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.

B. Owner will arrange for disconnecting and sealing indicated utilities serving structures to be demolished before start of demolition work, when requested by Contractor.

C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving structures to be demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.

D. Utility Requirements: Refer to Division 22 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

3.4 EXPLOSIVES

A. Explosives: Use of explosives will not be permitted.

3.5 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.6 DEMOLITION

A. Below-Grade Construction: Demolish foundation walls and other below-grade construction, as follows:

1. Completely remove below-grade construction, including foundation walls and footings.

B. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 024113

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SECTION 033000 - CAST-IN-PLACE CONCRETE

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. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement
7. Aggregates.
8. Admixtures:

    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
9. Vapor retarders.
10. Curing materials.

11. Joint fillers.
12. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

C. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.
6. Bonding agents.
7. Adhesives.
8. Vapor retarders.
9. Semirigid joint filler.
10. Joint-filler strips.

11. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:

a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

D. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

E. Preconstruction Test Reports: For each mix design.

F. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work 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.

B. Source Limitations:

C. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

D. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

E. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

a. Admixture dosage rates.
b. Slump.
c. Air content.
d. Seven-day compressive strength.
e. 28-day compressive strength.
f. Permeability.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F (1.7 deg C), other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F (35 deg C).
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type II gray.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Silica Fume: ASTM C1240 amorphous silica.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 1N coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:

a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. (2.37 kg/cu. m) for moderately reactive aggregate or 3 lb./cu. yd. (1.78 kg/cu. m) for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in

accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301 (ACI 301M).

2. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. 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 in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F (10 deg C): Black.
b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
c. Ambient Temperature Above 85 deg F (29 deg C): White.

D. Water: Potable or complying with ASTM C1602/C1602M.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

2.6 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested in accordance with ASTM C109/C109M.

2.7 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 (ACI 301M).

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. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 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.

2.8 CONCRETE MIXTURES

A. Normal-weight concrete used for footings, grade beams, and tie beams.

1. Exposure Class: ACI 318 (ACI 318M) F0 S0 C1.
2. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 4 inches (125 mm), plus or minus 1 inch.
5. Air Content:

    a. 3.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch (19-mm) nominal maximum aggregate size

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

B. Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 (ACI 318M) F0 S0 C0.
2. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
3. Maximum w/cm: 0.45
4. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm.
5. Air Content:

    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 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 and grade beams not less than 6 inches (150 mm), sealing vapor retarder to concrete.
4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.

3.4 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.
2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.
3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

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. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random 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, grade beams, 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. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.5 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. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, 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. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), 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.

E. 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 (ACI 301M).

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 (150 mm) 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.

F. 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.

3.6 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. Trowel and Fine-Broom Finish: Apply a first trowel finish to. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

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.

3.8 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1,) before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.
2) Maintain continuity of coating and repair damage during curing period.

3.9 TOLERANCES

A. Conform to ACI 117 (ACI 117M).

3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Slip-Resistant Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.11 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s).
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete.

    a. Limit cut depth to 3/4 inch (19 mm).
    b. Make edges of cuts perpendicular to concrete surface.
    c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    d. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

    a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.

6. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

7. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar.

    a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    b. Dampen cleaned concrete surfaces and apply bonding agent.
    c. Place patching mortar before bonding agent has dried.
    d. Compact patching mortar and finish to match adjacent concrete.
    e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall 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/C31M.
2. Testing agency shall 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 shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, 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.

C. 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.

D. 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. Verification of concrete strength before removal of shores and forms from beams and slabs.
    5. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M 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. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

        a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

    2. Slump: ASTM C143/C143M:

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/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight 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/C1064M:

   a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31/C31M:

   a. Cast and laboratory cure one set of four 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) 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/C39M.

   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 shall 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 shall 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 (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).
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 shall 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/C42M or by other methods as directed by Architect.

1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 (ACI 301M), 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.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 (ASTM E1155M) within 48 hours of completion of floor finishing and promptly report test results to Architect. Flatness and levelness shall conform to the following:
1. $SOF_F = 20$, $SOF_L = 15$

3.14 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 liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes Cast-in-Place Concrete for Following Items:

1. Thrust blocks.
2. Manholes.
3. Fence post footing.

1.2 SUBMITTALS

A. Product Data: Submit data on joint devices, attachment accessories, admixtures.

B. Design Data:

1. Submit concrete mix design for each concrete strength.
2. Submit separate mix designs if admixtures are required for following:

   a. Hot and cold weather concrete Work.
   b. Air entrained concrete Work.

3. Identify mix ingredients and proportions, including admixtures.
4. Identify chloride content of admixtures and whether or not chlorides were added during manufacture.

C. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of embedded utilities and components concealed from view in finished construction.

1.4 QUALITY ASSURANCE

A. Perform Work according to ACI 301 and 318.

B. Comply with ACI 305R when pouring concrete during hot weather.

C. Comply with ACI 306.1 when pouring concrete during cold weather.

D. Acquire cement and aggregate from one source for Work.

E. Perform Work according to SCDOT standards.

1.5 AMBIENT CONDITIONS

A. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete:

1. Cement:

a. Comply with ASTM C150, Type I - Normal.
b. Type: Portland.

2. Normal Weight Aggregates:

a. Comply with ASTM C33.
b. Coarse Aggregate Maximum Size: 3/4 inches, according to ACI 318.

3. Water:

a. Comply with ACI 318.
b. Potable.

B. Admixtures:

1. Air Entrainment: Comply with ASTM C260.
2. Chemical:

a. Comply with ASTM C494.
b. Type A - Water Reducing.

3. Fly Ash or Calcined Pozzolan: Comply with ASTM C618, Class F or C.
4. Silica Fume: Comply with ASTM C1240.
5. Slag:

a. Description: Ground-granulated blast-furnace slag.
b. Comply with ASTM C989.
c. Grade 100.

6. Plasticizing:

a. Comply with ASTM C1017.
b. Type I plasticizing, II plasticizing and retarding.

C. Joint Devices and Filler:

1. Joint Filler, Type A:

a. Description: Asphalt-impregnated fiberboard or felt.
b. Comply with ASTM D1751, D994.
c. Thickness: 1/4 inch.
d. Profile: Tongue-and-groove.

2. Sealant:

a. Comply with ASTM D6690, Type I.

2.2 CONCRETE MIX

A. Select proportions for normal weight concrete according to ACI 301, Method 1, 2, 3.

B. Performance and Design Criteria:

1. Compressive Strength: 3,000 psi or as noted on Drawings.
2. Cement Type: ASTM C150.
3. Aggregate Type: Normal weight.
4. Maximum Water-Cement Ratio: 0.45 by weight
5. Aggregate Size:

a. Maximum: 3/4 inch

6. Air Content: 3 to 6 percent, plus or minus 1.5 percent.
7. Admixture Type: Air - Entraining
8. Maximum Fly Ash or Pozzolan Content: 50 percent of cementitious materials by weight.
9. Maximum Slag Content: 50 percent of cementitious materials by weight.
10. Slump: 3 inches, plus or minus 1 inch.

C. Admixtures:

1. Include admixture types and quantities indicated in concrete mix designs only if approved by Engineer.
2. Cold Weather:

a. Use accelerating admixtures in cold weather.
b. Use of admixtures will not relax cold-weather placement requirements.

3. Hot Weather: Use set-retarding admixtures.
4. Do not use calcium chloride or admixtures containing calcium chloride.
5. Add air entrainment admixture to concrete mix for Work exposed to freezing and thawing or deicing chemicals.
6. For concrete exposed to deicing chemicals, limit fly ash, pozzolans, silica fumes, and slag content as required by applicable code.

D. Average Compressive Strength Reduction: Not permitted.

E. Ready-Mixed Concrete: Mix and deliver concrete according to ASTM C94, C685.

F. Site-Mixed Concrete: Mix concrete according to ACI 318.

2.3 ACCESSORIES

A. Bonding Agent:

1. Description: Polymer resin emulsion, Polyvinyl acetate, Latex emulsion, Two-component modified epoxy resin, Non-solvent two-component polysulfide epoxy, Mineral-filled polysulfide polymer epoxy, Mineral-filled polysulfide polymer epoxy resin, Polyamide-cured epoxy.

B. Non-shrink Grout:

1. Description: Premixed compound consisting of non-metallic aggregate, cement, and water-reducing and plasticizing agents.
2. Comply with ASTM C1107.
3. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.

C. Concrete Reinforcing Fibers:

1. Description: High-strength industrial-grade fibers specifically engineered for secondary reinforcement of concrete.
2. Comply with ASTM C1116.
3. Tensile Strength: 130 ksi.
4. Toughness: 15 ksi.
5. Fiber Length: 3/4 inch.
6. Fiber Count: 34 million per lb.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Previously Placed Concrete:

1. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
2. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Remove water from areas receiving concrete before concrete is placed.

3.3 INSTALLATION

A. Placing Concrete:

1. Place concrete according to ACI 301.
2. Notify testing laboratory and Engineer minimum 24 hours prior to commencement of operations.
3. Ensure that reinforcement, inserts, embedded parts, formed expansion and contraction joints, are not disturbed during concrete placement.
4. Joint Filler:

    a. Separate slabs on grade from vertical surfaces with 1/4-inch-thick joint filler.
    b. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface.
    c. Finish Joint Sealer Requirements: As specified by manufacturer.

5. Deposit concrete at final position, preventing segregation of mix.
6. Place concrete in continuous operation for each panel or section as determined by predetermined joints.
7. Consolidate concrete.
8. Maintain records of concrete placement, including date, location, quantity, air temperature, and test samples taken.
9. Place concrete continuously between predetermined expansion, control, and construction joints.
10. Do not interrupt successive placement and do not permit cold joints to occur.
11. Saw-Cut Joints:

    a. Saw-cut joints within 12 hours after placing.
    b. Cut into 1/4 depth of slab thickness.

B. 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 as necessary for hydration of cement and hardening of concrete.
3. Cure concrete according to ACI 308.1.

3.4 FIELD QUALITY CONTROL

A. Perform inspection and testing according to ACI 318.

B. Provide unrestricted access to Work and cooperate with appointed testing and inspection firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

D. Concrete Inspections:

1. Continuous Placement Inspection: Inspect for proper installation procedures.
2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

E. Strength Test Samples:

1. Sampling Procedures: Comply with ASTM C172.
2. Cylinder Molding and Curing Procedures:

    a. Comply with ASTM C31.
    b. Cylinder Specimens: Standard Field cured.

3. Sample concrete and make one set of three cylinders for every 75 cu. yd. or less of each class of concrete placed each day, and for every 5,000 sq. ft. of surface area for slabs and walls.
4. If volume of concrete for a class of concrete would provide less than five sets of cylinders, take samples from five randomly selected batches, or from every batch if less than five batches are used.
5. Make one additional cylinder during cold weather concreting and field cure.

F. Field Testing:

1. Slump Test Method: Comply with ASTM C143.
2. Air Content Test Method: Comply with ASTM C173, C231.
3. Temperature Test Method: Comply with ASTM C1064.
4. Compressive Strength Concrete:

    a. Measure slump and temperature for each sample.
    b. Measure air content in air-entrained concrete for each sample.

G. Cylinder Compressive Strength Testing:

1. Test Method: Comply with ASTM C39.
2. Test Acceptance: According to ACI 318.
3. Test one cylinder at 7 days.
4. Test one cylinder at 28 days.
5. Retain one cylinder for testing when requested by Engineer.
6. Dispose of remaining cylinders if testing is not required.

H. Core Compressive Strength Testing:

1. Sampling and Testing Procedures: Comply with ASTM C42.
2. Test Acceptance: According to ACI 318.
3. Drill three cores for each failed strength test from failed concrete.

I. Water-Soluble Chloride Ion Concentration Test Method:

1. Comply with ASTM C1218.
2. Test at 28 days.
3. Maximum Chloride Ion Concentration: As permitted by applicable code.

J. Patching:

1. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
2. Honeycombing or Embedded Debris in Concrete:

    a. Not acceptable.
    b. Notify Engineer upon discovery.

3. Patch imperfections as directed by Engineer, according to ACI 301, according to ACI 318.

K. Defective Concrete:

1. Description: Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.
2. Repair or replacement of defective concrete will be determined by Architect/Engineer.
3. Do not patch, fill, touch up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION 033000

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SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Concrete face brick.
3. Clay face brick.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry-joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.
10. Masonry-cell fill.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Cavity wall insulation.

C. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples: For each type and color of the following:

1. Exposed CMUs.

2. Clay face brick, in the form of straps of five or more bricks.
3. Special brick shapes.
4. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
5. Weep holes and cavity vents.
6. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For Installer and testing agency.Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C67.
d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Integral water repellent used in CMUs.
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.

C. 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 C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

D. 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.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

A. Masonry Installer: A single, experienced firm specializing in masonry construction with a minimum five year record of successful completion of projects of similar scope, capable of providing labor and material and performance bonds for its portion of the Work that are acceptable to the Owner. Installer shall furnish all required materials and equipment and perform the work of this Section with its own regular employees.

1. The lead/crew chief masons shall have had at least 3 years of experience with at least 5 projects of similar size and nature;
2. Installer shall have experienced superintendent and crew chiefs on site supervising the work whenever work is in progress.
3. Contractor's Own Forces: Contractor may utilize own forces for work of this Section when Contractor and Contractor's superintendent and crew chiefs meet the above qualifications.
4. Approved Joint Venture: Installer may consist of a joint venture between two or more experienced firms, each meeting the qualifications indicated above.

B. Installer Qualifications: Engage an experienced installer who specializes in masonry construction and has completed similar projects in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1. Submit list including minimum of five similar projects, including Project name, description of project size and scope, and name and contact information for architect, for Installer, superintendent, and crew chiefs. Indicate total years for experience for each.

C. Testing Agency Qualifications: An independent agency acceptable to authorities having jurisdiction and qualified according to ASTM C1093 for testing indicated.

D. Limitations on Aggregates: For concrete masonry units containing recycled materials or post-industrial waste, provide units free of impurities that will cause rusting, staining, or popouts and with a record of successful in-service performance in conditions similar to those expected at Project site.

1. Ferrous material shall be removed by magnetic separation.
2. Aggregates shall contain no combustible materials or coal cinders.
3. Aggregates shall be graded and supplied in consistent gradations from batch to batch.
4. Materials shall be tested according to the following:
    a. ASTM C40: Organic Impurities in Fine Aggregates for Concrete.
    b. ASTM C136: Sieve Analysis of Fine and Course Aggregate.
    c. ASTM C641: Iron Staining Materials in Lightweight Concrete Aggregates.
    d. ASTM C151: Autoclave Expansion of Hydraulic Cement (for popouts).
    e. ASTM C331: Lightweight Aggregates for Concrete Masonry Units.
5. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
6. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019.
7. Mortar Test: For mortar properties per ASTM C 270.

E. 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 for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.

a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
d. Include studs, sheathing, veneer anchors, flashing**, cavity drainage material**, and weep holes in exterior masonry-veneer wall mockup.

2. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
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.

5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Daily Log: Maintain a daily log of masonry work in progress for inspection by Owner, Architect, Special Inspector, or Authority Having Jurisdiction.

1. Indicate on small scale plans where masonry was erected.
2. Identify crew and assigned work area.
3. Certify that the following tasks have been performed.

a. Inspection of reinforcing and thru-wall flashings.
b. Inspection of construction and verification of compliance with requirements.
c. Testing of cavity drainage.
d. Daily cleaning.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

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. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of 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 a minimum of 24 inches down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover 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 near the 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.

F. Cleaning Masonry Surfaces: Comply with manufacturer's requirements and environmental conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

a. For Concrete Masonry Units: f'm = 2000 psi.

2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, 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 and will be within 20 feet vertically and horizontally of a walking surface.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Euclid Chemical Company (The); Eucon Blocktite.
2) GCP Applied Technologies; Dry-Block Block Admixture.
3) Master Builders Solutions; a BASF company; MasterPel 240.

C. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.5 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, 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.

2.6 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C216.

1. Manufacturers: Subject to compliance with requirements, provide face brick by one of the following:
    a. General Shale Brick, Inc.
    b. Meridian Brick.
    c. Palmetto Brick Company.
    d. Pine Hall Brick
    e. Taylor Clay Products, Inc.
    f. Triangle Brick Company.
2. Grade: SW.
3. Type: FBS.
4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi.
5. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C67.
6. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
7. Size (Actual Dimensions): 3-1/2 inches wide by 2-1/4 inches high by 7-1/2 inches long or 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
8. Application: Use where brick is exposed unless otherwise indicated.
9. Color and Texture:
    a. Split Faced and Smooth Faced Painted Surfaces:
        1) Basis-of-Design: Sherwin Williams.
        2) As indicated on Exterior Finish Schedule.

2.7 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. Argos USA; Eaglebond Portland Cement Lime.
b. Holcim U.S.; Cement-Lime.
c. SPEC MIX, Inc.; Portland Lime & Sand Masonry Mortar.

D. Masonry Cement: Not permitted.

E. Mortar Cement: ASTM C1329/C1329M.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. Argos USA; Superbond Mortar Cement.
b. Holcim U.S.; Mortar Cement.
c. SPEC MIX, Inc.; Mortar Cement and Sand Mortar.

F. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. Argos USA; Eaglebond Mortar Cement.
b. Holcim U.S.; Holcim Mortamix Custom Color Mortar Cement.
c. SPEC MIX, Inc.; Colored Mortar.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 10 percent of portland cement by weight.
4. Pigments shall not exceed 5 percent of mortar cement by weight.

G. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C404.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Euclid Chemical Company (The); Accelguard 80.
    b. GCP Applied Technologies; Morset.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Euclid Chemical Company (The); Eucon Blocktite.
    b. GCP Applied Technologies; Dry-Block Block Admixture.
    c. Master Builders Solutions; a BASF company; MasterPel 240.

K. Water: Potable.

2.8 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.187-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

E. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

F. Masonry-Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- diameter, hot-dip galvanized carbon steel continuous wire.

2.9 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
2. Where wythes are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel or stainless steel wire.

2.10 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings 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 snaplock receiver on exterior face where indicated to receive counterflashing.
5. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
6. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
7. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
8. Solder metal items at corners.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. copper core with polymer fabric laminated to copper face on both sides with non-asphaltic adhesive. Use only where flashing is fully concealed in masonry.

a. Products: Subject to compliance with requirements, provide one of the following:

1) STS Coatings; Wall Guard Copper TWF.
2) Wire-Bond; Copper Seal.
3) York Manufacturing, Inc.; Multi-Flash 500.

2. Laminated Stainless Steel Fabric Flashing, Non-Asphaltic: Stainless steel core with polymer fabric laminated to one stainless steel face with non-asphalt adhesive. Provide with manufacturer recommended accessory items for a complete compatible system.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) Hohman and Barnard, Inc.; Mighty-Flash Stainless Steel Fabric Flashing.
      2) Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing
      3) STS Coatings, Inc.; Gorilla Flash Stainless Fabric
      4) TK Products, Inc.; TK TWF
      5) York Manufacturing, Inc.; Multi-Flash SS

3. Self-Adhering Stainless Steel Flashing: 2-mil, Type 304 stainless steel core with one uncoated stainless steel face with butyl block copolymer adhesive. Use where flashing is fully concealed in masonry.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) Hohman and Bernard, Inc.; Mighty-Flash SA.
      2) Illinois Products, Inc.; IPCO Self-Adhesive Stainless Steel.
      3) TK Products, Inc.; TK Self-Adhering Stainless Steel TWF.
      4) Vapro Shield, Inc.; Vapro Thru-Wall Flashing SA.
      5) Wire-Bond; Bond'n Flash.
      6) York Manufacturing, Inc.; York 304 SS.

C. 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 with a drip edge.
4. Where flashing is fully concealed, use metal flashing or flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C920, chemically curing; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

E. Accessories: Provide preformed inside and outside corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

F. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

G. Drip Edges: Stainless-steel, 0.016-inch thick.

H. Termination Bars for Flexible Flashing: Stainless steel sheet 0.019 inch by 1-1/2 inches with a 3/8 inch sealant flange at top.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Weep/Cavity Vent Products: Use the following unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
    a. Products: Subject to compliance with requirements, provide one of the following:
        1) Advanced Building Products, Inc.; MortarMaze Cell Vent.
        2) Heckmann Building Products, Inc; No. 85 Cell Vent.
        3) Hohmann & Barnard, Inc.; QV Quardro-Vent.
        4) Wire-Bond; Cell Vent.

B. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Manufacturers: Subject to compliance with requirements, provide one of the following:
    a. Advanced Building Products Inc.; Mortar Break (1 to 1-3/4 inch air space) or Mortar Break II (2-inch airspace).
    b. Archovations, Inc.; CavClear Masonry Mat.
    c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
    d. Heckmann Building Products, Inc.; Weep-Thru Mortar Deflector.
    e. Hohmann & Barnard, Inc.; Mortar Trap.
    f. Mortar Net USA, Ltd.; Mortar Net.
2. Configuration: Provide one of the following:
    a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.12 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
    b. EaCo Chem, Inc.
    c. PROSOCO, Inc.

2.13 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime ormortar cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime or mortar cement mortar.
4. For reinforced masonry, use portland cement-lime or] mortar cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion or 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. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S.
4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type S.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of mortar cement by weight.
3. Mix to match Architect's sample.
4. Application: Use pigmented mortar for exposed mortar joints with the following units:
    a. Clay face brick.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.

F. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

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 impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

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.

D. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

E. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 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 feet, 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 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, 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 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, 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 feet 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 except due to warpage of masonry units within tolerances specified for warpage of units.

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. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out 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.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. 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.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. 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.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. General: Prepare mortar in accordance with current Portland Cement Association publications.

B. Prepare fresh mortar at the rate it will be used, in order to maintain consistent color and workability. Do not use mortar that has stiffened because of hydration. Discard when not used within the time recommended by mortar manufacturer or PCA publications, whichever is shorter. Retemper mortar carefully to avoid color changes, no more than twice per batch.

C. Measure mortar materials using cubic foot measuring box or other approved container of known volume, of size appropriate for operation. Use a consistent ratio of water to mortar materials, within the range recommended by the mortar manufacturer's written instructions.

1. Measurement of sand by shovel shall not be permitted.

D. Lay CMUs 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.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

E. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

G. Cut joints flush where indicated to receive cavity wall insulation unless otherwise indicated.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together as follows:

1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
    a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
    c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
2. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.7 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Embed tie sections in masonry joints.
2. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 25 inches o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

B. Provide not less than 1 inch of airspace between back of masonry veneer and face of insulation.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.8 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.

C. Form expansion joints in brick as follows:

1. Build in compressible joint fillers where indicated.
2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown 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.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe.
3. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
4. 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 079200 "Joint Sealants" for application indicated.
5. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
6. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.
3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

D. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.

1. Fill cavities full height by placing pea gravel in cavities as masonry is laid, so that at any point, masonry does not extend more than 24 inches above top of pea gravel.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

F. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. 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.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.13 KEY LOCK BOX INSTALLATION

A. Coordinate location with local fire department.

B. Install in accordance with manufacturer's written installation instructions.

3.14 FIELD QUALITY CONTROL

A. Water Testing: Upon request of the Architect, and as often as deemed appropriate by the Contractor, the cavity drainage system shall be tested by pouring a 5-gallon bucket of water into the masonry cavity, or use a hose bib, to verify system performance.

B. Flashing Inspections: Prior to concealment by closure of wall, coordinate and schedule inspection of through-wall flashings with Architect.

3.15 REPAIRING, POINTING, 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 brushing 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 wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
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 or pressurized water cleaning methods described in BIA Technical Notes 20.
6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.16 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess clean masonry waste and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 042200 - CONCRETE UNIT MASONRY

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. Concrete masonry units.
2. Mortar
3. Grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Miscellaneous masonry accessories.

B. Products installed, but not furnished, under this Section include the following:

1. Anchor rods and embed plates indicated to be built into masonry, furnished under Division 05 Section "Structural Steel Framing"

C. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 03 Section Division 05 Section "Cast-in-Place Concrete" for reinforcing steel dowels for anchoring concrete unit masonry to cast-in-place concrete.
3. Division 07 Section "Water Repellents" for water repellents applied to unit masonry.
4. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 INFORMATIONAL SUBMITTALS

A. Product Data:

1. Single Wythe Masonry Joint reinforcement
2. Rigid Anchors

B. Contractor's Statement of Responsibility Per Division 01 Section "Collective Inspections and Structural Testing"

C. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

    a. Show elevations of all reinforced walls including reinforcing per typical details for all openings including but not limited to openings for ductwork and piping.
    b. Dowels shall match typical wall reinforcing unless noted otherwise.
    c. Dowels shall extend a lap distance above finished floor, unless top of footing is more than typical bar lift below finished floor. In such an instance dowel shall extend a lap distance out of footing.
    d. Coordinate bar lift detailing with sequencing requirements of part 3 of this specification section.
    e. Layout cmu control joints per contract documents and show associated typical reinforcing.
    f. General Contractor shall coordinate all necessary openings in masonry walls with all subcontractors and shall provide information to reinforcing steel detailer for preparation of shop drawings.
    g. Where above the ceiling coordination drawings are a project requirement the coordination drawings shall be provided to the reinforcing steel detailer to aid in developing elevation of reinforced walls.

D. Qualification Data:

1. Masonry Installer.
2. Post Installed Structural Anchor Installer

E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Concrete Masonry Units.

    a. Submit material test reports for each type of mix to be use in production of block for the project.
    b. Submit material test reports not more than 180 days old demonstrating compliance with the specified ASTM standards and project requirements.

2. Concrete Masonry Unit Aggregates: For concrete masonry units containing recycled material or post-industrial waste for aggregates provide test reports in accordance with the quality assurance requirements below.
3. Mortar Aggregates
4. Mortar Cementitious Materials
5. Grout Fine Aggregates (for field mixed grout only)

6. Grout Course Aggregates (for field mixed grout only)
7. Grout Cementitious Materials (for field mixed grout only)

F. Material Certificates: For each of the following indicating compliance with the required standards and signed by manufacturers:

1. Concrete Masonry units (for each type and size):

   a. Include material test reports substantiating compliance with requirements.
   b. Include data and calculations establishing average net-area compressive strength of each size and profile of block to be used on the project.
   c. Include a statement confirming that cmu produced for the project will use materials identical to those used in producing the block for which test reports are submitted.

2. Grout Cementitious materials.

   a. Submit material certificates not more than 90 days old demonstrating compliance with the specified ASTM standards.

3. Mortar Cementitious materials.

   a. Submit material certificates not more than 90 days old demonstrating compliance with the specified ASTM standards.

4. Grout Coarse Aggregates

   a. Submit material certificates not more than 90 days old demonstrating compliance with the specified ASTM standards.

5. Grout Fine Aggregates.

   a. Submit material certificates not more than 90 days old demonstrating compliance with the specified ASTM standards.

6. Mortar Fine Aggregates

   a. Submit material certificates not more than 90 days old demonstrating compliance with the specified ASTM standards.

7. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

8. Preblended Grout mixes. Include description of type and proportions of ingredients.

G. Design Mixtures:

1. Grout: For each type of grout

   a. Indicate amounts of mixing water to be withheld for later addition at Project site.

b. Mix design submittals shall include test results and/or trial batch data that meet or exceed the required average compressive strengths required by ACI 301. In accordance with ASTM C476 all testing shall be completed per ASTM C10119.
c. Trial batches shall consist of identical cementitious materials, fine and course aggregates, and admixtures to be used for mix design.
d. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

2. Mortar: For each type of mortar

a. Indicate materials to be used
b. Indicate proportioning of ingredients.
c. Indicate repeatable means of measuring ingredient proportions.
d. When using the ASTM C270 property specification include test reports. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

H. Research/Evaluation Reports:

1. Post installed structural anchors: See specification section 050520

I. Hot and Cold Weather Program: Describe in detail procedure for working in Hot and Cold Weather. Included detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Masonry Installer: A single, experienced firm, or an approved joint venture, specializing in masonry construction with a minimum five- year record of successful completion of projects of similar scope, capable of providing labor and material and performance bonds for its portion of the Work that are acceptable to the Owner. Installer shall furnish all required materials and equipment and perform the work of this Section with its own regular employees.

1. The masonry supervisor/foreman shall have had at least 5 years of experience with at least 5 projects of similar size and nature; he shall not act as or become a production worker.
2. The lead/crew chief masons shall have had at least 3 years of experience with at least 5 projects of similar size and nature;
3. Installer shall have experienced masonry superintendent and crew chiefs on site supervising the work whenever work is in progress.
4. Contractor’s Own Forces: Contractor may utilize own forces for work of this Section when Contractor and Contractor’s masonry superintendent and crew chiefs meet the above qualifications.

C. Post Installed Structural Anchor Installer: See specification section 050520 for requirements

D. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

E. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

F. Limitations on Aggregates: For concrete masonry units containing recycled material or post-industrial waste, provide units free of impurities that will cause rusting, staining or popouts and with a record of successful in-service performance in conditions similar to those expected at Project site.

1. Ferrous material shall be removed by magnetic separation.
2. Aggregates shall contain no combustible materials.
3. Aggregates shall be graded and supplied in consist graduations from batch to batch.
4. Material shall be tested according to the following:

    a. ASTM C40: Organic Impurities in Fine Aggregates for Concrete.
    b. ASTM C 136: Sieve Analysis of Fine and Coarse Aggregate.
    c. ASTM C 641: Staining Materials in Lightweight Concrete Aggregates.
    d. ASTM C 151: Autoclave Expansion of Hydraulic Cement (for popouts.)

G. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

H. Grout Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design grout mixtures.

I. Daily Log: Maintain a daily log of masonry work in progress for inspection by Owner, Architect, Special Inspector or Authority Having Jurisdiction.

1. Indicate on small scale plans where masonry was erected.
2. Indicate on small scale plans where masonry was grouted.
3. Identify crew and assigned work area.
4. Certify that the following tasks have been performed.

    a. Inspection of construction and verification of compliance with requirements as indicated in schedule of special inspections.
    b. Daily Cleaning.

J. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of 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 a minimum of 24 inches down both sides of walls and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover 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 near the 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 ACI 530.1/ASCE 6/TMS 602.

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 ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Regional Materials: Provide CMUs that have been manufactured within 500 miles (800 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, bond beams and other special conditions.

2. Provide square edge units for outside corners unless otherwise indicated
3. Provide bullnose units for outside vertical corners except as follows:

    a. First course at finished floor
    b. Courses intersecting with ceiling plane

4. Provide bullnose units for sills unless otherwise indicated

C. Cell Layout:

1. All block shall be of standard two cell or open end configuration.
2. All block shall be configured such that it allows for both of the following:

a. Placement of reinforcing as indicated with not less than 1/2" clear grout cover between the bar and the block.
b. For the required bonding pattern the block will provide a minimum 3 inch by 3 inch continuous vertical column to receive grout.

D. Integral Water Repellent: Provide units made with integral water repellent for exterior wall units.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

E. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification:
   a. Lightweight unless otherwise indicated.

3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.3 CONCRETE AND MASONRY LINTELS

A. Concrete Lintels: Where specifically indicated provide formed-in-place concrete lintels complying with requirements in Division 03 Section "Cast-in-Place Concrete," and with reinforcing bars indicated.

B. Masonry Lintels: Unless indicated otherwise provide built-in-place masonry lintels made from lintel or channel concrete masonry units for the bottom course, and bond beam units for additional courses indicated with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.

2.4 MORTAR AND GROUT MATERIALS

A. Regional Materials: Provide aggregate for mortar and grout, cement, and lime that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Masonry Cement: Not Permitted

F. Mortar Cement: ASTM C 1329.

G. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

H. Aggregate for Grout: ASTM C 404.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.

K. Water: Potable.

2.5 REINFORCEMENT

A. Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Finish: Hot Dip Galvanized
2. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.

4. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.

6. Provide in lengths of not less than 10 feet with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

D. Masonry Joint Reinforcement for Composite Masonry:

1. Ladder type
2. One side rod at each face shell of hollow masonry units more than 4 inches wide
3. One side rod at each wythe of masonry 4 inches wide or less.

E. Masonry Joint Reinforcement for Multiwythe Cavity Wall Masonry:

1. Adjustable (two-piece) type, ladder design
2. One side rod at each face shell of backing wythe
3. Separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
4. Tie Section:
   a. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
   b. Provide rectangular units with closed ends and not less than 4 inches wide.

F. Veneer Joint Reinforcement: Single W1.7 or 0.148-inch diameter, hot-dip galvanized, carbon-steel continuous wire.

2.6 MISCELLANEOUS ANCHORS

A. Post Installed Structural Anchors: See specification section 055020 for products

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

A. Vertical Reinforcing Bar Positioners: Custom fabricated wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding vertical reinforcing bars in proper location of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.

1. Provide units with two loops for masonry walls indicated to have a single vertical reinforcing bar at each grout spacing.

   a. Loop layout shall allow for placement of vertical reinforcing in center of cmu wall thickness unless noted otherwise

2. Provide units with four loops or a pair of units with two loops for masonry walls indicated to have two vertical reinforcing bars at each grout spacing.

   a. Provide custom fabricated positioners with loop layout to allow for placement of vertical reinforcing as indicated in the contract documents.

B. Horizontal Reinforcing Bar Positioners: Custom fabricated wire units designed to fit into mortar bed joints spanning masonry unit cells and bent down for holding horizontal reinforcing bars at proper height in lintels and bond beam. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.

a. Provide custom fabricated positioners to allow for placement of horizontal reinforcing in lintels as indicated in the contract documents.
b. Positioners for continuous bond beams shall center reinforcing in the depth of the bond beam unit unless noted otherwise.

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Preblended, Dry Grout Mix: Furnish dry grout ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

D. Mortar for Unit Masonry: Provide "Type S" mortar complying with ASTM C 270, Proportion or Property Specification unless indicated otherwise.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.

2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 as follows:

a. 28-day compressive strength of 3000 psi unless noted otherwise.
b. Provide grout with a slump of 8 to 11 as measured according to ASTM C 143/C 143M.

3. Ready-Mixed Grout: Measure, batch, mix, and deliver grout according to ASTM C 476, and furnish batch ticket information.

a. Slump shall be adjusted on site as necessary, and grout shall be re-mixed at mixing speed for at least one minute before discharging to achieve the desired consistency.

4. Project-Site Mixed Grout: Mix preblended, dry grout mix according to ASTM C 476.

a. Mix in a mechanical mixer for a minimum of 5 minutes with sufficient water to achieve the desired consistency.
b. Hand mixing of grout is not permitted
c. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

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 work.
2. Verify that foundations are within tolerances specified.
3. Verify that foundations are "broom" clean and free of debris or other laitance that may compromise mortar bond.
4. Verify that reinforcing dowels are properly placed and extend to the proper elevation.

B. Before installation, examine rough-in and built-in construction for electrical, mechanical, piping and other systems to identify locations of built in construction.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. 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.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.3 TOLERANCES

A. Comply with the construction tolerances in ACI 5301.1 unless modified herein.

B. 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.

C. 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 feet, 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 feet , 1/4 inch in 20 feet, or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, 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 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet , 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 feet, 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 except due to warpage of masonry units within tolerances specified for warpage of units.

D. 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 for typical bed joints.
2. For bed joints on foundations the minimum thickness shall be 1/4 inch and the maximum thickness shall be 3/4 inc.

3. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
4. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.]
6. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out 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.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond. Bond each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Reinforced Masonry: Keep vertical cells aligned to maintain continuous unobstructed cells not less than 3 inches by 3 inches to receive reinforcing steel and grout.

E. Stopping and Resuming Work: Stop work by racking 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.

F. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

G. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

H. 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.

I. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, leaving a minimum 1” clearance between masonry and structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. 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 inch clearance between end of anchor rod and end of tube. Space anchors 32 inches o.c. unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. General: Prepare mortar in accordance with current Portland Cement Association publications.

B. Prepare fresh mortar at the rate it will be used, in order to maintain consistent color and workability. Do not use mortar that has stiffened because of hydration. Discard when not used within the time recommended by mortar manufacturer or PCA publications, whichever is shorter. Retemper mortar carefully to avoid color changes, no more than twice per batch.

C. Measure mortar materials using cubic foot measuring box or other approved container of known volume, of size appropriate for operation. Use a consistent ratio of water to mortar materials, within the range recommended by the mortar manufacturer's written instructions.

D. Lay hollow CMUs as follows:

1. Only lay cmu on foundations after they have achieved a "broom" clean condition and are free of debris or other laitance that may compromise mortar bond.
2. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
3. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
4. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
5. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
6. With head joints filled to a minimum thickness equal to the face shell of the unit on both faces of the unit.

E. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

G. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

H. Immediately after placing a course of masonry clean mortar drippings and fins from cells to receive reinforcing. Care shall be taken to collect the loose material and remove it from the cell and not allowing it to collect at the bottom of the cell.

3.6 COMPOSITE MASONRY

A. Bond wythes of composite masonry together as follows

1. Masonry Joint Reinforcement: Install ladder-type reinforcement in horizontal mortar joints and extending across both wythes.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide rigid metal anchors not more than 16 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.7 MASONRY-CELL INSULATION

A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to 1 story high, but not more than 20 feet.

3.8 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 24 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.

3.10 LINTELS

A. Built in Place Lintels:

1. Provide lintels where shown and where openings of more than 12 inches for block-size units are shown without structural steel or other supporting lintels.
2. Construct from closed bottom lintel or channel concrete masonry units for the bottom course with reinforcing steel placed as indicated, supported on positioners and anchored in place. Bond beam units are not permitted for bottom course.
3. Provide bond beam units for additional courses indicated with reinforcing steel placed as indicated supported on positioners and anchored in place.
4. Fill the entire depth and length of the lintel grout in one grout pour. Grout joints are not permitted in lintels.
5. Temporarily support built-in-place lintels until cured.
6. Provide minimum bearing of 16 inches at each jamb unless otherwise indicated.

3.11 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. 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.
2. 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.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602 and as follows:

1. Center all vertical reinforcing steel on the thickness of the concrete masonry unit unless noted otherwise.
2. Bar positioners must be anchored in place with mortar.
3. Sequencing:

    a. Reinforcing steel from previous grout lift extends a lap distance out of hardened grout.
    b. No additional reinforcing is placed, and additional masonry is laid up, but not exceeded the grout pour height limit.
    c. Reinforcing bar positioner is placed in the bed joint of the second course of additional masonry, and below the last bed joint of additional masonry with additional bar positioners installed such that spacing does not exceed 48 inches on center
    d. The cells of additional masonry are cleaned of mortar droppings and mortar fins.

e. A lift of reinforcing steel is dropped into the previously laid masonry using the bar positioners to ensure proper location. The reinforcing steel shall extend above the proposed grout pour height by a minimum of one splice distance.
f. The grout lift is placed and consolidate.
g. The sequence is repeated.

4. Where a reinforced cell is noted to have the vertical reinforcing offset from the center of the concrete masonry unit then provide special two loop bar positioners to locate each vertical bar and the associated splice bar per the contract documents.

   a. Alternately a two loop bar positioner may be installed rotated parallel to the face shells to locate the vertical bar and the associated splice bar per the contract documents.

5. Where a reinforced cell is noted to have two vertical bars provide special four loop bar positioners to locate each vertical bar and the associated splice bar per the contract documents.

   a. Alternately a pair of two loop bar positioners may be installed rotated parallel to the face shells to locate each vertical bar and the associate splice bar per the contract documents.

6. A minimum of 1” clear shall be maintained between pairs of parallel bars occurring in the same vertical cell, lintel or bond beam.
7. A minimum of 1” clear shall be maintained between vertical bars or pairs of vertical bars and , piping or other embeds occurring in the same vertical cell.
8. A minimum of ½” shall be maintained between any reinforcing bar and the adjacent masonry unit.
9. Wet setting of reinforcing steel into previously placed grout is not permitted.

C. Conduits, Piping, Panels, Boxes and other Embedded Equipment

1. The maximum outside diameter of any vertical conduit or piping located in a grouted cell shall be as follows:

   a. 1.5 inches for 12 inch cmu
   b. 1.125 inches for 8 inch cmu
   c. 1 inch for 6 inch cmu
   d. Where vertically reinforced and grouted cells are not specifically located in the contract documents it is acceptable to relocate the vertically reinforced and grouted cell to the next adjacent cell to avoid a conduit or pipe of larger dimension than permitted. The typical center to center spacing of vertically reinforced and grouted cells shall be maintained.
   e. Where vertically reinforced and grouted cells are specifically located in the contract documents, conduit or pipes of dimensions larger than permitted shall be routed to avoid the vertically reinforced and grouted cells. In the case that the conduit or piping cannot be routed to avoid the vertically reinforced and grouted cell the Engineer shall be contacted for resolution.

2. Horizontal runs of conduit or pipe are not permitted in within lintels or bond beams

3. Horizontal runs of conduit or pipe passing through vertically reinforced and grouted cells are not permitted.
4. Piping containing either of the following shall not be located in grouted masonry:

    a. Liquid, gas or vapors at temperatures higher than 150 degrees Farenheit
    b. Under pressures in excess of 55 psi
    c. Containing water or other liquids when they are subject to freezing

5. Inset panels, boxes, fire extinguisher cabinets and other embedded items are not permitted in grouted cells.

    a. Where vertically reinforced and grouted cells are not specifically located in the contract documents it is acceptable to relocate the vertically reinforced and grouted cell to the next adjacent cell to avoid conflict with embedded equipment. The typical center to center spacing of vertically reinforced and grouted cells shall be maintained.
    b. Where vertically reinforced and grouted cells are specifically located in the contract documents and conflict with embedded equipment, the embedded equipment shall be surface mounted or relocated as allowed by the contract documents. Where contract documents do not allow for surface mounting or relocating the equipment the Engineer shall be contacted for resolution.

D. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Prior to grouting all grouted cells shall be inspected to ensure cells are free of loose mortar droppings or debris.

    a. All debris and mortar droppings shall be removed.
    b. All hardened mortar or mortar fins protruding more than 1/2 inch into cell shall be removed.

2. For grout pours of 60 inches or more, and other locations where specifically indicated provide cleanouts at the bottom of each grouted cell

    a. Where cleanout will is located at location and elevation where the finished wall is exposed the cleanout shall be created by removing the face shell of a full block to allow for a seamless appearance by patching with a full face shell.
    b. Where the cleanout will be concealed in finished construction the cleanout can be formed such that the grout will form the finished surface at the cleanout. Cleanout shall be a minimum of 4 inches by 4 inches.

3. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for grout properties and minimum grout space.
4. Limit height of vertical grout lifts and grout pours to not more than 60 inches.
5. Grout all courses of lintels and beams in one continuous operation for the full height of the lintel or beam. Do not allow cold joints in lintels and beams.
6. Grout lifts shall be terminated at top of walls shall be carefully consolidated to ensure grout is cured flush to top of masonry, and provides solid bearing beneath all bearing plates.

7. Grout lifts terminating at bond beams, except at top of wall shall stopped 1/2" down from top of bond beam
8. Typical grout lifts, not terminating at bond beam or top of wall shall be terminated a minimum of 1 1/2", but not more than 3" below a bed joint.
9. All grout lift terminations shall be coordinate with reinforcing steel layout to ensure proper lap distance of reinforcing steel. Grout pours shall not be terminated anywhere along the length of the splice.
10. All grout shall consolidated using internal vibration with a pencil type vibrator.

    a. Consolidate grout in each cell or bond beam immediately after placement. Top of bond beam or cell to desired height after initial consolidation.
    b. Reconsolidate grout in each cell or bond beam after initial water loss and settlement has occurred approximately 10 minutes after initial consolidation. Top of bond beam or cell to desired height after reconsolidation.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 REPAIRING, POINTING, 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 brushing 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 wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.14 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.

END OF SECTION 042200

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SECTION 050520 - POST INSTALLED STRUCTURAL ANCHORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Cartridge injection adhesive anchors

B. This specification section is only intended for use when specifically required by the drawings or other referencing specifications and structural applications. This section is not intended for use in non-structural applications or where not specifically referenced by the drawings or other specification sections.

C. Related Sections include the following:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 04 Section “Concrete Unit Masonry”
3. Division 06 Section "Rough Carpentry" for anchorage of wood framing

1.3 PERFORMANCE REQUIREMENTS

A. The basis of design products are as specified in this specification or the contract documents. Product substitutions must have capacities equal to or greater than values calculated for each specific condition calculated when calculated using the data in the referenced ESR report and in accordance with the appropriate design procedure and standards required by the building code. See requirements for substitution submittals.

1.4 DEFINITIONS

A. Post Installed Structural Anchors: Anchors supporting and/or anchoring structural elements of the building which are installed into hardened concrete or masonry and that are specified in the contract documents or performance based shop drawing design submittals for structural elements.

B. Wedge Anchors: A torque-controlled anchor, with an integral cone expander and single piece steel expansion clip providing 360-degree contact with the base material while not requiring

oversized holes for installation and an impact section to prevent thread damage with required nuts and washers.

C. Cartridge Injection Adhesive Anchors: An anchor system consisting of rod insert, nut, washer and a cartridge type, two-component polymer or hybrid mortar adhesive system dispensed and mixed through a static mixing nozzle supplied by the manufacturer.

1.5 SUBMITTALS

A. Contractor's Statement of Responsibility Per Division 01 Section "Collective Inspections and Structural Testing"

B. Product Data:

1. Cartridge Injection Adhesive Anchors

C. Research/Evaluation Reports:

1. Submit ICC reports for the following:

a. Cartridge Injection Adhesive Anchors

D. Substitutions:

1. Substitution requests may only be made using products with ICC-ESR reports for the product in the specific substrate.
2. Substitution request shall include signed and sealed calculations demonstrating that the product is capable of providing equivalent performance of the specified product for each specific location and condition when calculated using the data in the referenced ESR report and in accordance with the appropriate design procedure and standards required by the building code.
3. Substitution request shall specify the diameter and embedment depth of the substituted product
4. Any increase in material labor cost resulting from the substitution shall be the responsibility of the contractor.

E. Manufacturer's Instruction: Manufacturer's Installation Instructions

F. Qualification Data: Submit installer qualification data as stated in Quality Assurance section. Qualifications shall be submitted in a letter format for each type of anchor to be installed, and shall include the following:

1. The specific product to be used
2. Complete description of installation procedure
3. Personnel to be trained on anchor installation
4. Date of Manufacturer training
5. Manufacturer's training certificates or letter from manufacturer certifying training was complete with a list of individuals that were trained.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: The installer shall be experienced in installing anchors equal to type, and into the substrate material required for this project

B. Installer Training: Conduct a thorough training session with the manufacturer's representative. Each individual responsible for the installation of anchors shall attend the training session. Training shall consist of a review of the complete process for the installation of the anchors and the use of proper equipment for drilling and installing the anchors, to include but not limited to:

1. Hole drilling procedure. Clarify acceptability of rotary hammer drilling and/or core drilling.
2. Hole drilling equipment
3. Type and diameter of drill bits
4. Hole preparation and hole cleaning technique
5. Hole cleaning equipment
6. Adhesive injection technique
7. Adhesive injection equipment
8. Anchor rod, nut and washer material requirements and associated cleaning requirements
9. Anchor and Anchor rod installation
10. Anchor tightening
11. Adhesive curing requirements

C. Certifications: All anchors shall have an ICC ESR Evaluation report indicating conformance with the current applicable Acceptance Criteria for the building code applicable to the project.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Keep anchors, rod materials, nuts and washers in manufacturer's packaging with label intact until needed for use.

B. Keep anchors free of dirt and debris.

C. Store anchors in a clean dry area

D. Protect anchors from corrosion and deterioration.

E. Store anchors and adhesives in strict accordance with manufacturer's requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nuts: Having a proof load stress equal or greater than the minimum tensile strength of the associated anchor where type and strength is not specifically indicated by anchor or adhesive manufacturer.

B. Washers: Of type and material compatible with nuts unless specifically indicated by anchor or adhesive manufacturer.

C. Plate Washers: Provide ASTM A36 plate washers of size and configuration specifically indicated.

2.2 CORROSION RESISTANCE

A. Anchors and Anchor Bodies

1. Uncoated Carbon Steel: Carbon steel anchors uncoated and free from oil, lubricants and other deleterious substances.Acceptable for use as follows:

a. Interior dry conditions

2. Zinc Plated: Zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) Acceptable for use as follows:

a. Interior dry conditions

3. Hot Dip Galvanized: Carbon steel anchors with hot-dipped galvanized in accordance with ASTM A 153. Acceptable for use as follows:

a. Interior dry conditions
b. Exterior conditions
c. Anchoring galvanized steel elements

4. Stainless Steel: AISI Type 304 or 316 stainless steel and complying with ASTM F 593. Acceptable for use as follows:

a. Anchoring treated lumber elements
b. Anchoring stainless steel elements

B. Nuts

1. Uncoated carbon steel: Acceptable for use as follows:

a. With Uncoated Anchors

2. Hot Dip Galvanized: Hot-dipped galvanized in accordance with ASTM A153. Acceptable for use as follows:

a. With Zinc Plated Anchors
b. With Hot Dip Galvanized Anchors

3. Stainless Steel: ASTM F594. Acceptable for use as follows:

a. With Stainless Steel Anchors

C. Washers

1. Uncoated carbon steel: Acceptable for use as follows:

a. With uncoated anchors

2. Hot Dip Galvanized: Hot-dipped galvanized in accordance with ASTM A153. Acceptable for use as follows:

a. With Hot Dip Galvanized Nuts

3. Stainless Steel: AISI Type 304 or 316 stainless steel. Acceptable for use as follows:

a. With Stainless Steel Nuts

D. Plate Washers:

1. Uncoated carbon steel: Acceptable for use as follows:

a. With Uncoated Nuts

2. Hot Dip Galvanized: Hot-dipped galvanized in accordance with ASTM A 153. Acceptable for use as follows:

a. With Hot Dip Galvanized Nuts

2.3 WEDGE ANCHORS

A. Provide anchors with length identification markings conforming to ICC-ES AC01 or ICC-ES AC193 as appropriate based on the anchor substrate..

B. Size: As indicated on drawings

C. Embedment depth: As indicated on the drawings but not less than the manufacturer's documented minimum embedment depth. Where not specifically indicated use manufacturer's minimum documented embedment depth.

1. Embedment depth is from surface of concrete or masonry. Anchor lengths and extent of threads shall account for embedment depth, connected elements, plate washers, washers, nut and appropriate stick thru.

D. Concrete Anchors:

1. Anchors shall be tested in accordance with ACI 355.2 and the most recent issue of ICC-ES AC193 including the following:

    a. All mandatory testing
    b. Shear and tension in cracked concrete.
    c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 318 Appendix D
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

    a. Hilti Kwik Bolt TZ with nut and washer, of required finish, ICC ESR-1917
    b. Approved equal (See substitution requirements)

E. Masonry Anchors:

1. Anchors for masonry shall be tested in accordance with most recent edition of ICC-ES AC01 including the following

    a. All mandatory testing
    b. Seismic tension and shear
    c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 530
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

    a. Hilti Kwik Bolt 3 with nut and washer, of required finish, ICC ESR-1385.
    b. Approved equal (See substitution requirements)

2.4 CARTRIDGE INJECTION ADHESIVE ANCHORS

A. Provide anchors with length identification markings conforming to ICC-ES AC58 or ICC-ES AC308.

B. Size: As indicated on drawings

C. Embedment depth: As indicated on the drawings but not less than the manufacturer's documented minimum embedment depth. Where not specifically indicated use manufacturer's minimum documented embedment depth.

1. Embedment depth is from surface of concrete or masonry. Anchor lengths and extent of threads shall account for embedment depth, connected elements, plate washers, washers, nut and appropriate stick thru.

D. Adhesive: Two component epoxy or two component hybrid system.

E. Concrete Anchors:

1. Anchors shall be tested in accordance with the most recent issue of ICC-ES AC308 including the following:

    a. All mandatory testing
    b. Shear and tension in cracked concrete.
    c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 318 Appendix D as amended by the specific design provisions of ICC-ES AC308
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

    a. Rods, washers, and nuts of required finish with Hilti HIT RE 500 V3 Adhesive Anchorage System for anchorage to concrete, ICC ESR-3814.
    b. Rods
        1) Carbon Steel Rods: ASTM A193 B7 coated as required for use
        2) Stainless Steel Rods: ASTM F593, CW

    c. Approved equal (See substitution requirements)

4. Where Hilti HIT-HY 200, ICC ESR-3187 system is specifically indicated in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

    a. For anchors 3/8” to 3/4” diameter: HIT-Z Standard or HIT-Z-R SS rods, washers, and nuts of required finish.
    b. Approved equal (See substitution requirements)

F. Masonry Anchors:

1. Anchors for masonry shall be tested in accordance with most recent edition of ICC-ES AC58 including the following

    a. All mandatory testing
    b. Seismic tension and shear
    c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 530
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

    a. Grouted Masonry: HAS-E Standard or HAS SS rods, washers, and nuts of required finish with Hilti HIT HY 70 Adhesive Anchorage System for anchorage to masonry, ICC ESR-2682.

    b. Approved equal (See substitution requirements)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Installation constitutes acceptance of existing conditions and responsibility of satisfactory performance.

3.2 INSTALLATION, GENERAL

A. Where manufacturer recommends the use of special tools for installation of anchors, such tools shall be used.

B. Match mark and drill, match drill or use other methods to ensure anchors are properly located.

C. Do not adjust anchor location after installation. Coordinate with EOR for modifications to connected element where anchors are incorrectly located.

D. All facets of hole drilling, hole cleaning, anchor installation, anchor torqueing shall be in strict accordance with the ICC-ESR report and manufacturer’s data.

E. Drill holes perpendicular to substrate surface.

F. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits as indicated in the ICC-ESR report.

G. Drill bits and core bits shall be of diameters indicated in the ICC-ESR report.

H. All holes shall be cleaned with compressed air to remove all drilling dust and other deleterious substances.

I. Remove water from holes to attain a surface dry condition unless specifically permitted otherwise by ICC-ESR report.

J. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

K. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

L. Perform anchor installation in strict accordance with manufacturer instructions and ICC-ES report.

M. Anchors shall be installed perpendicular to the substrate face within plus or minus 5 degrees unless specifically permitted otherwise by ICC-ESR report.

N. Install plate washers where specifically indicated or where connected elements have oversized holes.

O. Install a round washer under nuts. Round washers are in addition to plate washers where plate washers are required.

3.3 WEDGE ANCHORS

A. Protect threads from damage during anchor installation.

B. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Engineer.

3.4 CARTRIDGE INJECTION ADHESIVE ANCHORS

A. Clean all holes per manufacturer instructions using manufacturer's approved tools to remove loose material and drilling dust prior to installation of adhesive.

B. Inject adhesive into 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.

C. Follow manufacturer recommendations to ensure proper mixing of adhesive components.

D. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface.

E. Remove excess adhesive from the surface.

F. Shim anchors with suitable device to center the anchor in the hole.

G. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

H. Observe manufacturer recommendations with respect to installation temperatures.

I. Hilti HIT-HY200 system anchors shall be installed using the Hilti Safe Set Technology.

1. For conditions using HAS rods the Hilti hollow drill bit and Hilt vacuum system shall be employed.

3.5 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

B. Galvanizing Repairs: Prepare and repair damaged galvanized coatings with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 050520

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Slotted channel framing.
4. Downspout guards.
5. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

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 bollards.
6. Pipe guards.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.

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 jurisdiction in which Project is located.

B. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research Reports: For post-installed anchors.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

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.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

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.
2. Material: Cold-rolled steel, ASTM A1008/A1008M, commercial steel, Type B; 0.0966-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

F. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

G. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

H. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

I. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

J. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, 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. Provide stainless steel fasteners for fastening aluminum.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, 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; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; 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. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM 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 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

G. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing 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 embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.8 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 and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.9 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.

2.10 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 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.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Utility shelving.
3. Plywood backing panels.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that tre… lude physical properties of treated materials based… ency.
3. For fire-retardant trea… mber both before and after exposure to elevated… independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

FIRE RETARDANT TREATED WOOD IS NOT ALLOWED BY OSF GUIDE, SECTION 1.9.B

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.4 INFORMATIONAL SUBMITTALS

A. Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.

B. Qualification Statemen… ion marking for fire-retardant treated material, an… ties having jurisdiction that periodically performs… g the classification marking is representative of the m…

FIRE RETARDANT TREATED WOOD IS NOT ALLOWED BY OSF GUIDE, SECTION 1.9.B

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber:

1. Dimension Lumber: 15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 PRESERVATIVE TREATMENT

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood blocking, stripping, and similar concealed members attached in contact with masonry or concrete.

2.3 FIRE-RETARDANT TREATMENT

FIRE RETARDANT TREATED WOOD IS NOT ALLOWED BY OSF GUIDE, SECTION 1.9.B

A. General: Where fir , materials shall comply with requirements in this ving jurisdiction, and with fire-

test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated ess after being subjected to accelerated wea exterior locations and where indicated.
3. Interior Type A: f 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.

FIRE RETARDANT TREATED WOOD IS NOT ALLOWED BY OSF GUIDE, SECTION 1.9.B

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Grounds.
4. Utility shelving.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. Utility Shelving: Lumber with 15 percent maximum moisture content of any of the following species and grades:

1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
2. Spruce-pine-fir (south) or spruce-pine-fir; Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. Concealed Boards: 19 percent maximum moisture content and the following species and grades:

1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
2. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
3. Eastern softwoods; No. 2 Common grade; NeLMA.

E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, ~~fire-retardant~~ treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
2. For pressure-preservative-treated wood, use stainless steel fasteners.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening to Metal Framing: ASTM C1002 or ASTM C954, length as recommended by screw manufacturer for material being fastened.

2.7 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or SBS-modified asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency ~~exposed to view.~~

C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

D. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

H. Securely attach rough 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 (IBC).
2. ICC-ES evaluation report for fastener.

I. 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.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061100 – STRUCTURAL WOOD FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Structural Wood blocking.

1.3 PERFORMANCE REQUIREMENTS

A. The basis of design for proprietary products are as specified in this specification or the contract documents. Product substitutions must have capacities equal to or greater than values calculated for each specific condition calculated when calculated using the data in the ESR report associated with the product and in accordance with the appropriate design procedure and standards required by the building code. See requirements for substitution submittals.

1.4 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber:

1. Beams: Lumber of 2 inches nominal or greater but less than 5 inches in least dimension.
2. Columns: Lumber of 2 inches nominal or greater but less than 7 inches in least dimension.

C. Boards: Lumber of less than 2 inches nominaL in thickness and 2 inches nominal or greater width.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. SPIB: The Southern Pine Inspection Bureau.
2. NeLMA: Northeast Lumber Manufacturers' Association
3. WCLIB: West Coast Lumber Inspection Buerau
4. WWPA.: Western Wood Products Association
5. NLGA: National Lumber Grades Authority.
6. RIS: Redwood Inspection Service.

1.5 SUBMITTALS

A. Contractor's Statement of Responsibility Per Division 01 Section "Collective Inspections and Structural Testing"

B. Product Data

1. Dimensional Lumber

a. For each size and grade. Indicate species and grade.

2. Boards

a. For each size and grade. Indicate species and grade.

3. Adhesive
4. Metal Framing Anchors and associated proprietary fasteners
5. Nails
6. Wood Screws
7. Lag Bolts
8. Bolts
9. Post installed structural anchors: See specification section 050520
10. Wood Preservative treated wood

a. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
b. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
c. Include copies of warranties from chemical treatment manufacturer

C. Evaluation Reports: For the following, from ICC-ESR:

1. Wood-preservative-treated wood.
2. Power-driven fasteners.

3. Metal framing anchors.
4. Post installed structural anchors: See specification section 050520

D. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

E. Substitutions:

1. Substitution requests may only be made using products with ICC-ESR reports for the proposed product covering the specific conditions present for the use of the product on this project.

2. Substitution request shall include signed and sealed calculations demonstrating that the product is capable of providing equivalent performance of the specified product for each specific location and condition when calculated using the data in the ESR report associated with the product and in accordance with the appropriate design procedure and standards required by the building code.
3. The design shall be completed without regard for strength contribution from sheathing materials.
4. Any increase in material labor cost resulting from the substitution shall be the responsibility of the contractor.

F. Qualification Data:

1. Post Installed Structural Anchor Installer per specification section 050520
2. Powder Actuated Fastener Installer: Submit installer qualification data as stated in Quality Assurance section. Qualifications shall be submitted in a letter format for each type of anchor to be installed, and shall include the following.

   a. The specific product to be used
   b. Complete description of installation procedure
   c. Manufacturer's training certificates

1.6 QUALITY ASSURANCE

A. Post Installed Structural Anchor Installer: See specification section 050520 for requirements

B. Actuated Fastener Installer: All installers shall be experienced in installing anchors equal to type and into the substrate material required for the project. All installers shall have a manufacturer's training certificate.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship for the following:

1. Dimension lumber framing.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. After treatment redry to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood plates, sills, blocking, and similar members in contact with masonry or concrete.
2. Wood framing attached directly to the interior of below-grade exterior masonry or concrete walls.
3. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
4. Wood floor plates that are installed over concrete slabs-on-grade.
5. Wood exposed to weather

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Wall Framing:

1. Grade: No. 2 grade.
2. Application: Interior partitions not indicated as load-bearing.
3. Species: Spruce-pine-fir; NLGA.

B. Load Bearing Interior Wall Framing:

1. Grade: ??????
2. Species: ???????

a. Mixed Souther Pine, SPIB
b. Southern pine; SPIB.
c. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Exterior Wall Framing:

1. Grade: ??????
2. Species: ???????

a. Mixed Souther Pine, SPIB
b. Southern pine; SPIB.
c. Spruce-pine-fir; NLGA.
d. Douglas fir-south; WWPA.
e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

D. Ceiling Joists:

1. Grade: ??????
2. Species:

a. Mixed Souther Pine, SPIB
b. Southern pine; SPIB.
c. Spruce-pine-fir; NLGA.
d. Douglas fir-south; WWPA.
e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

E. Floor Joists

1. Grade: ??????
2. Species:

a. Mixed Souther Pine, SPIB
b. Southern pine; SPIB.
c. Spruce-pine-fir; NLGA.
d. Douglas fir-south; WWPA.
e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

F. Rafters

1. Grade: No. 2 or better.
2. Species:

a. Southern pine; SPIB.

G. Blocking

1. Grade: No. 2 or better.
2. Species:

a. Southern pine; SPIB.

H. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Application: Exposed interior framing
2. Species and Grade:

a. As indicated above for load-bearing construction of same type unless noted otherwise.

2.4 BOARDS

A. Maximum Moisture Content: 19 percent.

B. Provide boards hand selected for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel.

B. Nails: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 hex nuts and ASTM F844 flat washers.

G. Post installed structural anchors: See specification section 050520

2.6 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those **of basis-of-design products**. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency and documented in an evaluation report.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

E. Stainless-Steel Sheet: ASTM A 666, Type 316.

1. Use for exterior locations and where indicated.

2.7 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.

B. Set all members with crown up.

C. All plies of multi-ply members shall be glued together with adhesive. Unless indicated otherwise each ply shall be fastened to the previous ply with (2)-rows of 16D “sinker” nails at 9” O.C.

D. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

E. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

I. All blocking to be installed between framing members shall be cut to fit snug and in direct contact with surrounding framing members.

J. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not

inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.

K. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

L. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

N. 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.

O. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

P. For exposed deck boards used concealed fastener system installed in accordance with manufacturer’s instructions.

3.2 WALL FRAMING INSTALLATION

A. General: Unless noted otherwise install wall framing as follows:

B. Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs

C. Space studs not more than 16” O.C.

D. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
1. Install additional blocking as required for sheathing installation requirements.

E. Construct corners and intersections with three or more studs to provide surfaces necessary to receive sheathing.

F. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

3.3 JOIST FRAMING INSTALLATION

A. General: Unless noted otherwise install as follows:

1. Install floor joists with crown edge up
2. Space joists not to exceed 16” O.C.
3. Support ends of each member to bear full width of supporting member and anchor as follows:

    a. Where supported on wood members, by using metal framing anchors.
    b. Where framed into wood supporting members, by using metal joist hangers.

4. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 36 inches.
5. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.
6. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
7. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
8. Provide bridging between joists of type indicated below, at the midspan of joist and at intervals not exceeding 96 inches o.c., and as required for sheathing installation requirements.

    a. Solid 2x wood blocking of depth matching framing for use when blocking is required for sheathing installation requirements.
    b. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal size lumber, double-crossed and nailed at both ends to joists.
    c. Steel bridging installed to comply with bridging manufacturer's written instructions.

B. Floor Joist: Unless noted otherwise install as follows:

1. Provide solid blocking between joists under jamb studs for openings.
2. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
3. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

C. Ceiling Joist: Unless noted otherwise install as follows:

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate fasten to first joist with framing anchors.
2. Unless noted otherwise installed ceiling joists directly adjacent to rafters and face nail ceiling joist to rafter

3.4 ROOF FRAMING INSTALLATION

A. Rafters: Unless noted otherwise install as follows:

1. Space rafters not to exceed 16” O.C.
2. Notch to fit exterior wall plates and use metal framing anchors.
3. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers.
4. Where rafters abut at ridge, place directly opposite each other.
5. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and of depth equal to or greater than plumb cut of jack rafter.
6. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and of depth equal to or greater than plumb cut of jack rafter.
7. Bevel ends of jack rafters for full bearing against valley and hip framing.
8. At hips and valleys bevel cut top surface of hip/valley framing for flush bearing of sheathing
9. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.5 SHEAR WALL PANELS

A. Install shear wall panels in strict accordance with the manufacturer’s written instructions.

B. Provide and install a complete assembly as shown in the shop drawings.

3.6 FASTENERS

A. Lag screws: Shall be installed as follows:

1. A predrilled clearance hole with diameter equal to 100% of the lag screw shank diameter shall be drilled to a depth equal to the unthreaded portion of the shank.
2. A predrilled lead hole with diameter equal to 75% of the lag screw shank diameter shall be drilled to a depth of the lag screw embedment.
3. The lag screw shall be inserted into the hole with a turning action and not a driving action.
4. Where not specifically indicated otherwise the minimum embedment into the main member shall be four times the lag screw shank diameter.
5. Holes in steel elements of the connection shall have a hole diameter of 1/16” diameter greater than the fastener diameter for fasteners 3/8” or greater in diameter, and 1/32” diameter greater than the fastener diameter for fasteners less than 3/8” in diameter.

B. Wood screws: Shall be installed as follows:

1. A predrilled lead hole with diameter equal to 70% of the screw root diameter shall be drilled to a depth of the wood screw embedment.
2. The wood screw shall be inserted into the hole with a turning action and not a driving action.
3. Where not specifically indicated otherwise the minimum embedment into the main member shall be six times the wood screw diameter.

4. Holes in steel elements of the connection shall have a hole diameter of 1/32” diameter greater than the fastener diameter.

C. Bolts: Shall be installed as follows:

1. Holes in wood members shall be drilled with a diameter to match the bolt diameter.
2. Holes in steel elements of the connection shall have a hole diameter of 1/16” diameter greater than the fastener diameter for fasteners 3/8” or greater in diameter, and 1/32” diameter greater than the fastener diameter for fasteners less than 3/8” in diameter.
3. A flat washer shall be provided under the head or the nut where the head or nut is bearing on the wood surface.
4. A flat washer shall be provided under the head or the nut when the head or the nut bears on a steel element and will be the turned element when tightening.

3.7 METAL FRAMING ANCHORS

A. Install metal framing anchors to comply with manufacturer's written instructions.

B. Install fasteners through each anchor hole unless noted otherwise.

C. Install fasteners of max number and size indicated in manufacturer’s data unless noted otherwise.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061100

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied, emulsified-asphalt dampproofing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 FIELD CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 PERFORMANCE REQUIREMENTS

A. VOC Content: Products are to comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.3 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carlisle Coatings and Waterproofing.
2. Henry Company.
3. W. R. Meadows.

B. Trowel Coats: ASTM D1227, Type II, Class 1.

C. Fibered Brush and Spray Coats: ASTM D1227, Type II, Class 1.

D. Brush and Spray Coats: ASTM D1227, Type III, Class 1.

2.4 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for surface smoothness, maximum surface moisture content, and other conditions affecting performance of the Work.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for dampproofing application.

B. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

C. Clean substrates of projections and substances detrimental to dampproofing work; fill voids, seal joints, and remove bond breakers if any.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.

1. Apply dampproofing to provide continuous plane of protection.
2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.

1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding

an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.

1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.

3.4 INSTALLATION OF COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.

B. Masonry Backup for Masonry Veneer Assemblies: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft..

C. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft..

3.5 PROTECTION

A. Correct dampproofing that does not comply with requirements; repair substrates, and reapply dampproofing.

END OF SECTION 071113

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SECTION 072119 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam insulation.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Closed-cell spray polyurethane foam insulation.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by qualified testing agency.

B. Research Reports: For spray-applied polyurethane foam-plastic insulation, from an agency acceptable to authorities having jurisdiction.

C. Field quality-control reports.

D. Qualification Statements: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Spray Polyurethane Foam: ASTM C1029, Type II, minimum density of 1.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BASF Corporation - Spray Foam; Walltite US Series.
b. Carlisle Spray Foam Insulation; Sealtite PRO.
c. Johns Manville, a Berkshire Hathaway Company; JM Corbond III.

2. 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: 450 or less.

3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

E. Cavity Walls: Install into cavities to thickness indicated on Drawings.

F. Miscellaneous Voids: Apply according to manufacturer's written instructions.

G. Install ignition barrier material.

1. Do not cover insulation prior to any required spray foam insulation inspections.

H. Apply barrier 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.

3.3 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.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 072119

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SECTION 072600 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Reinforced-polyethylene vapor retarders.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for under-slab vapor retarders.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Reinforced-polyethylene vapor retarders.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 REINFORCED-POLYETHYLENE VAPOR RETARDERS

A. Reinforced-Polyethylene Vapor Retarders: Sheet with outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 20 lb/1000 sq. ft., with maximum permeance rating of 0.1 perm.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Protecto Wrap.
b. Stego Wrap.
c. W. R Meadows.

2.2 ACCESSORIES

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 PROTECTION

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 072600

SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal soffit panels.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Metal soffit panels.

B. Product Data Submittals:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

C. 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 flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. 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. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

2.2 METAL SOFFIT PANELS

A. Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Metal Soffit Panels:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. McElroy Metal, Inc., Marquee-Lok (Basis-of-Design).
    b. CENTRIA Architectural Systems.
    c. Firestone Metal Products, LLC.
    d. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle Company.
2. Profile: Flush.
3. Material: Aluminum sheet, 22 gage thick.
    a. Color: White.
4. Panel Coverage: 12 inches.
5. Panel Height: 1 inch.
6. Sealant: Factory applied within interlocking joint.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

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. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. 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.
2. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.
    a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF METAL SOFFIT PANELS

A. Install metal panels according to manufacturer's written 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. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
3. Copper Panels: Use copper, stainless steel, or hardware-bronze fasteners.
4. Stainless Steel Panels: Use stainless steel fasteners.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. 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, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074293

SECTION 075310 - EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

This Section includes the following:

1. Adhered membrane roofing system.
2. Roof insulation.

Related Sections include the following:

3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings, including those installed as part of the work of this section and covered under the warranty provisions of this section.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review submittals required for the work of this Section.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness.
6. Review structural loading limitations of roof deck during and after roofing.
7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
8. Review governing regulations and requirements for insurance and certificates if applicable.
9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.

B. Roof Inspections:

1. Contractor and Manufacturer's assigned representative shall inspect the roof deck, documenting deficiencies requiring correction prior to start of roofing as a condition of acceptance.
2. Manufacturer shall provide project start-up guidance and direction at start of installation and then provide inspections by manufacturer's field inspector at 25-percent, 50-percent, and final installations, with inspection reports submitted to the Roofing Installer, General Contractor, Architect, and Owner. Deficiencies shall be listed on the inspections reports and all repairs and

corrections shall be made and certified as completed and approved by inspector and submitted with next and final report.

~~3.~~ Manufacturer's Final Completion and Warranty Inspection: Upon completion of the Work, the roofing manufacturer's representative, in the presence of the Owner and Architect, shall inspect the roofing work. Discrepancies shall be recorded and immediately rectified. Installer shall issue written confirmation certifying deficiencies have been properly corrected.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of' SPRI's Directory of Roof Assemblies listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work specific to this Project, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with adjoining air barrier.

C. Samples for Verification: For the following products:

1. Roof membrane and flashings, of color required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

E. Evaluation Reports: For components of roofing system, from ICC-ES.

F. Field Test Reports:

1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

G. Field quality-control reports.

H. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and listed in SPRI's Directory of Roof Assemblies for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, roofing accessories, manufacturer's edge metal products, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Roofing Installer's Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, cover boards, roofing accessories, manufacturer's edge metal products, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.

3. Wind Uplift Load Capacity: As indicated on Drawings.

2.2 EPDM ROOFING MEMBRANE

EPDM Roofing Membrane: ASTM D 4637, Type I, nonreinforced uniform, flexible sheet made from EPDM.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Roofing Systems.
   b. Carlisle SynTec Systems.
   c. Versico Roofing Systems.
2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
3. Thickness: 60 mils, nominal.

4. Exposed Face Color: White.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

C. Roof Vents: As recommended by roof membrane manufacturer.

1. Size: Not less than 4-inch diameter.

D. Bonding Adhesive: Manufacturer's standard.

E. Slip Sheet: Manufacturer's standard, of thickness required for application.

F. Asphalt-Coated, Glass-Fiber-Mat, Venting Base Sheet: ASTM D4897/D4897M, Type II; nonperforated, asphalt-impregnated fiberglass reinforced, with mineral granular patterned surfacing on bottom surface.

G. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

H. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured by EPDM roof membrane manufacturer, approved for use in SPRI's Directory of Roof Assemblies listed roof assemblies.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 2, Grade 2, glass-fiber mat facer on both major surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlisle Coatings & Waterproofing.
b. GAF Commercial Roofing Products.
c. Johns Manville Roofing System.

2. Compressive Strength: 20 psi.
3. Size: 48 by 96 inches.
4. Thickness: Required to achieve R-value indicated on Drawings.

2.5 INSULATION ACCESSORIES AND COVER BOARD

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to initial mechanically-fastened insulation layer as follows:

1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
2. Full-spread, spray-applied, low-rise, two-component urethane adhesive.

D. Glass-Mat Gypsum Cover Board: ASTM C1177/C1177M, water-resistant gypsum board.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. Georgia-Pacific Corporation.
b. National Gypsum Corporation.
c. USG Corporation.

2. Thickness: 1/2 inch.
3. Surface Finish: Factory primed.

2.6 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

1. Size: Approximately 36 by 60 inches.
2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

1. Submit test result within 24 hours after performing tests.

a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

3.4 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Wood Decking:

1. Mechanically fasten slip sheet to roof deck using mechanical fasteners specifically designed and sized for fastening slip sheet to wood decks.

a. Fasten slip sheet according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.

2. Install base layer of insulation with [joints staggered not less than 24 inches in adjacent rows] [end joints staggered not less than 12 inches in adjacent rows].

a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

1) Trim insulation so that water flow is unrestricted.

e. Fill gaps exceeding 1/4 inch with insulation.
f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

g. Loosely lay base layer of insulation units over substrate.

3. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood decks.

a. Fasten insulation according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
b. Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

4. Install upper layers of insulation[and tapered insulation] with joints of each layer offset not less than 12 inches from previous layer of insulation.

a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

1) Trim insulation so that water flow is unrestricted.

f. Fill gaps exceeding 1/4 inch with insulation.
g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
h. Loosely lay each layer of insulation units over substrate.
i. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
2) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
3) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.5 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.

a. Trim cover board so that water flow is unrestricted.

3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Loosely lay cover board over substrate.
5. Adhere cover board to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
b. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
c. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

B. Install slip sheet over cover board and beneath roof membrane.

C. Place plates on insulation in required fastening patterns to achieve FM rating and secure in accordance with manufacturer's instructions.

1. Install plates and fasteners tight and flat to substrate with no dimpling, and with fastener extending 1 inch minimum into roof deck; do not overdrive fasteners.

3.6 INSTALLATION OF ADHERED ROOF MEMBRANE

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 INSTALLATION OF WALKWAYS

A. Flexible Walkways:

1. Install flexible walkways at the following locations:

   a. Retain one or more subparagraphs below. Revise to suit Project.
   b. Perimeter of each rooftop unit.
   c. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
   d. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
   e. Top and bottom of each roof access ladder.
   f. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
   g. Locations indicated on Drawings.
   h. As required by roof membrane manufacturer's warranty requirements.

2. Provide 6-inch clearance between adjoining pads.
3. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Perform the following tests:

1. Flood Testing: Flood test each roof area for leaks, according to recommendations in ASTM D5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

   a. Perform tests before overlying construction is placed.
   b. Flood to an average depth of [2-1/2 inches] <Insert depth> with a minimum depth of [1 inch] <Insert depth> and not exceeding a depth of [4 inches] <Insert depth>. Maintain 2 inches of clearance from top of base flashing.
   c. Flood each area for [24] [48] [72] hours.
   d. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.

      1) Cost of retesting is Contractor's responsibility.

e. Testing agency shall prepare survey report indicating locations of initial leaks, if any, and final survey report.

C. Final Roof Inspection: Upon completion of the Work and prior to final payment, the membrane manufacturer's representative, in the presence of the Owner and Architect, shall inspect Work. Discrepancies shall be recorded and immediately rectified. Final payment will not be issued until the manufacturer's representative has given his approval for Work and closeout submittals, including roof maintenance manual and warranties, have been received by the Architect.

1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.

D. Verify field strength of seams a minimum of twice daily, according to manufacturer's written instructions, and repair seam sample areas.

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.

3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 PATCHING LIMITATIONS

A. Patching Restrictions:

1. No more than five (5) in-field patches and no more than a total of 4 linear feet of seam patching per 100 sq. ft. of roof's total square footage and as determined by Architect.
2. Seam patches shall be minimum 8 inches wide by 24 inches long strip patch.
3. Manufacturer's required circular seam intersection patches shall not be considered when calculating number of patches.
4. Typical patch size shall be minimum 6 inches square with rounded corners or as recommended by the roof membrane manufacturer.
5. The use of large size patches for covering multiple penetrations to avoid exceeding the limits set forth above shall not be permitted.
6. The use of large patches in excess of 24 by 36 inches shall be justification for replacement or for providing overlay membrane.

3.12 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <Insert name of Owner>.
2. Address: <Insert address>.
3. Building Name/Type: <Insert information>.
4. Address: <Insert address>.
5. Area of Work: <Insert information>.
6. Acceptance Date: _____.
7. Warranty Period: <Insert time>.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    a. lightning;
    b. peak gust wind speed exceeding <Insert mph>;
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075310

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SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Low-slope roof sheet metal fabrications.
2. Miscellaneous sheet metal fabrications.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Low-slope roof sheet metal fabrications.
2. Miscellaneous sheet metal fabrications.

B. Product Data Submittals:

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.

C. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.

3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

D. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Special warranty.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 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 SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

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.

2. Color: To be determined.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.

1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).

D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.

1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621. 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.

3. Color: To be determined.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fabral.
b. Henry.
c. Berridge.
d. Polyguard Products.

2. Source Limitations: Obtain underlayment from single source from single manufacturer.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
    c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
2. Fasteners for Copper, Zinc-Tin Alloy-Coated Copper, or Copper-Clad Stainless Steel Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.
3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
4. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
5. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
6. Fasteners for Zinc Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.

C. Solder:

1. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

H. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

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.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. 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.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. 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.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.040 inch thick.
2. Galvanized Steel: 0.028 inch thick.

3. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.
2. Galvanized Steel: 0.022 inch thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

C. Flashing Receivers: Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.
2. Galvanized Steel: 0.022 inch thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

B. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Stainless Steel: 0.0250 inch thick.
2. Galvanized Steel: 0.040 inch thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lap joints not less than 2 inches.

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

1. Lap horizontal joints not less than 4 inches.
2. Lap end joints not less than 12 inches.

C. 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.

D. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lapp joints not less than 4 inches.

3.3 INSTALLATION, 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, solder, 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.
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. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.
9. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious 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, 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.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder aluminum sheet.
3. Do not pretin zinc-tin alloy-coated copper.
4. Do not use torches for soldering.
5. Heat surfaces to receive solder, and flow solder into joint.
    a. Fill joint completely.
    b. Completely remove flux and spatter from exposed surfaces.
6. Stainless Steel Soldering:
    a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
    b. Promptly remove acid-flux residue from metal after tinning and soldering.
    c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
7. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
8. Copper-Clad Stainless Steel Soldering: Tin edges of uncoated sheets, using solder for copper-clad stainless steel.

H. Rivets: Rivet joints in [**uncoated aluminum**] [**zinc**] where necessary for strength.

3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

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 [**riveted and soldered joints**] [**or**] [**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 [**cleat**] [**eave or apron flashing**].
8. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
9. Anchor gutter with [**gutter brackets**] [**straps**] [**twisted straps**] spaced not more than [**24 inches**] [**30 inches**] [**36 inches**] <**Insert dimension**> apart to roof deck unless otherwise indicated, and loosely lock to front gutter bead.
10. Anchor gutter with spikes and ferrules spaced not more than [**24 inches**] [**30 inches**] <**Insert dimension**> apart.
11. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 feet apart. Install expansion-joint caps.
12. Install continuous gutter screens on gutters with noncorrosive fasteners, [**removable**] [**hinged to swing open**] for cleaning gutters.

C. Downspouts:

1. Join sections with 1-1/2-inch 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.

D. Splash Pans:

1. Install where downspouts discharge on [**low-slope roofs**] <**Insert surface**>.
2. Set in [**asphalt roofing cement**] [**or**] [**elastomeric sealant**] compatible with the substrate.

E. Parapet Scuppers:

1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
2. Anchor scupper closure trim flange to exterior wall and [**solder**] [**or**] [**seal with elastomeric sealant**] to scupper.
3. Loosely lock front edge of scupper with conductor head.
4. [**Solder**] [**or**] [**seal with elastomeric sealant**] exterior wall scupper flanges into back of conductor head.

F. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below [**scupper**] [**or**] [**gutter**] discharge.

G. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches in direction of water flow.

3.5 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements[**, sheet metal manufacturer's written installation instructions,**] and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
    a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at [**24-inch**] [**16-inch**] <**Insert dimension**> centers.
    b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches over base flashing.
3. Lap counterflashing joints minimum of 4 inches.
4. Secure in waterproof manner by means of [**snap-in installation and sealant or lead wedges and sealant**] [**interlocking folded seam or blind rivets and sealant**] [**anchor and washer spaced at 12 inches o.c. along perimeter and 6 inches o.c. at corners areas**] <**Insert requirement**> unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with [**elastomeric**] [**butyl**] sealant and clamp flashing to pipes that penetrate roof.

3.6 INSTALLATION OF WALL FLASHINGS

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.

C. Reglets: Installation of reglets is specified in Section 042000 "Unit Masonry."

3.7 INSTALLATION OF MISCELLANEOUS FLASHING

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.

3.8 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.10 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 076200

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Butyl joint sealants.
6. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Joint-sealants.
2. Joint sealant backing materials.

B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Preconstruction Laboratory Test Reports: For each joint sealant and substrate material to be tested from sealant manufacturer, indicating the following:

a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
b. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Authorized representative who is trained and approved by manufacturer.
2. Testing Agency: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

1.7 MOCKUPS

A. Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

1.9 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 joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.10 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 SILICONE JOINT SEALANTS

A. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 100/50, Uses T and NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 890-SL
b. Pecora Corporation; 300 SL
c. Sika Corporation; 728 SL
d. Tremco Incorporated; Spectrem 900 SL

2. Exterior Joint Locations:

a. Construction joints in cast-in-place concrete.

b. Other exterior horizontal traffic joints.

3. Interior Joint Locations:

a. Control and expansion joints in tile flooring.

2.4 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 790
b. GE Momentive SilPruf LM SCS2700
c. Pecora Corporation; 890
d. Sika Corporation; 290
e. Tremco Incorporated; Spectrem 1

2. Exterior Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Control and expansion joints in unit masonry.
c. Metal panels.
d. Joints between different materials listed above.
e. Exterior perimeter joints between materials listed above and frames of doors, windows, and louvers.
f. Control and expansion joints in ceilings and other overhead surfaces.
g. Other vertical or horizontal non-traffic joints.

3. Interior Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Interior perimeter joints of exterior openings.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 786
b. Pecora Corporation; 898
c. Sika Corporation; SikaSil N
d. Tremco; Tremsil 600 White

2. Interior Joint Locations:

a. Tile control and expansion joints.

b. Joints between plumbing fixtures and adjoining walls, floors, and counters.

2.6 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Bostik; Chem-Calk 300
b. Pecora; BC-158
c. Tremco; General Purpose Butyl Sealant

2. Exterior Joint Locations: Under door thresholds.

2.7 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Building Systems; Sonolac
b. Bostik, Inc.; Chem-Calk 600
c. Pecora Corporation; AC-20+
d. Tremco Incorporated; Tremflex 834

2. Interior Joint Locations:

a. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.

1) Color: Paintable white.

b. Other non-dynamic interior joints including between interior wall surfaces and casework.

1) Color: Clear.

2.8 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.
3. Interior custom hollow-metal doors and frames.
4. Exterior custom hollow-metal doors and frames.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

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, and glazing.

C. Samples: For hollow-metal doors and frames with factory-applied color finishes.

D. 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.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.

B. Field quality control reports.

1.8 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Amweld International, LLC.
b. Ceco Door Products; an Assa Abloy Group Company.
c. Curries Company; an Assa Abloy Group company
d. Deansteel Manufacturing Company, Inc.
e. Mesker Door Inc.

f. Palmetto Metal Products, Inc.
g. Pioneer Industries.
h. Steelcraft; an Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

A. 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 and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to 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 according to UL 1784 and installed in compliance with NFPA 105.
2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg Btu/F x h x sq. ft. when tested according to ASTM C518.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule.

1. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches.
c. Face: Uncoated steel sheet, minimum thickness of 0.053 inch.
d. Edge Construction: Model 2, Seamless, unless noted otherwise..
e. Core: Manufacturer's standard.
f. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and temperature-rise-rated doors.

2. Frames:

a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
b. Construction: Face welded.

3. Exposed Finish: As indicated on Exterior Finish Schedule.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule.

1. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches.
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
d. Edge Construction: Model 2, Seamless.
e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
f. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
g. Core: Manufacturer's standard.
h. Fire-Rated Core: Manufacturer's standard core for fire-rated doors.

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
b. Construction: Face welded.

3. Exposed Finish: As indicated on Exterior Finish Schedule.

2.5 BORROWED LITES

A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch.

B. Construction: Face welded.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.7 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.8 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.9 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.10 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.

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.
    a. 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.
    b. Install frames with removable stops located on secure side of opening.
2. Fire-Rated Openings: Install frames according to NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.
4. Solidly pack mineral-fiber insulation inside frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. 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 according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 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.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

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SECTION 086200 - UNIT SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dynamic dome curb-mount standard size unit skylights with curbs.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of unit skylight.

1. Include construction details, material descriptions, dimensions of individual components and profiles and finishes for unit skylights.
2. Electric Motors: Show nameplate data, power requirements, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: For unit skylight work.

1. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.

C. Aluminum Finish Samples: For each type of exposed finish required, in a representative section of each unit skylight in manufacturer's standard size.

D. Glazing Samples: For each color and finish of glazing indicated, 4-inches square and of same thickness indicated for the final Work.

E. Product Schedule: For unit skylights. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: For each type and size of unit skylight, for tests performed within the last four years by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For unit skylights to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating unit skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Installer Qualifications: An installer acceptable to unit skylight manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Uncontrolled water leakage.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   c. Yellowing of acrylic glazing.
   d. Breakage of polycarbonate glazing.
   e. Deterioration of insulating-glass hermetic seal.
2. Warranty Period: 10 years from date of manufacture with remaining time transferred to Owner on date of Substantial Completion.
3. No Leak Warranty: 10 years from date of manufacture with remaining time transferred to Owner on date of Substantial Completion.
4. Glass Seal Warranty: 20 years from date of manufacture with remaining time transferred to Owner on date of Substantial Completion.
5. Dynamic Dome Warranty: 15 years from date of manufacture with remaining time transferred to Owner on date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Unit Skylight Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Certification: AAMA-, WDMA-, or CSA-certified unit skylights with label attached to each.

2.2 UNIT SKYLIGHTS

A. Unit skylight with formed dynamic domes and innovative extruded 100 percent thermally broken aluminum frames with condensation management and counterflashing for mounting on roof curbs and roof pitches 0 to 60 degrees. Optional accessories as required to meet installation and performance requirements.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Skylights, Inc.
2. Artistic Skylight Domes Ltd.
3. Sun-Tek Skylights.
4. Velux America, LLC.

C. Unit Shape and Size - Dynamic Dome Skylight: Size as indicated on Drawings

D. Skylight Unit: Height 30 percent of skylight width, vacuum formed with precise repeating geometric patterns, and overall shape to maximize strength and daylight at low solar elevation angles 10 to 40 degrees. Outer dome shall be formed from smooth sheet and not prismatic in order to transmit all incident daylight through outer dome. Initial rise of dome shall be at an angle of at least 60 degrees to horizontal in order to harvest daylight at low-solar elevation angles 10 through 40 degrees. Provide polycarbonate domes with integral UV blocking-cap layer that prevents long-term yellowing and ensures material strength and performance stability.

1. Double dome:
   a. Polycarbonate:
      1) Outer Lite: Clear polycarbonate; 0.118-inch thick with UV blocking-cap layer.
      2) Inner Lite: White Prismatic polycarbonate; 0.118-inch thick.

E. Aluminum Frame Counter Flashing: Maintenance-free, extruded aluminum, grade 6063-T5, 0.06 inch thick with neutral gray powder-coat finish. Counterflashing frames completely welded in corners and counter flashes curb a minimum of 1.625 inch. Provide aluminum frame with at least 0.75-inch continuous ledge on each side of skylight that is a pinch free access for stacking, manual transportation, and mounting of skylights.

1. Unit Sizes: As indicated on Drawings.

F. Condensation Drainage Gasket: Factory-applied, 100 percent thermally broken black thermoplastic gasket encapsulating entire interior aluminum-frame assembly for a thermal-break weather seal and to accommodate condensation drainage.

G. Structural Sealant: Factory-applied silicone sealant, gray color, bonding dome to aluminum frame and suitable for external exposure.

H. Performance Requirements:

1. Unit Skylight: AAMA/WDMA/CSA 101/LS.2/A440 (NAFS-11 or previous):
   a. Design Pressure (DP): Minimum +/- 30 psf. Dome shall not invert at positive design pressure.
   b. Water Test Pressure: Minimum 4.6 psf with no leakage at 5-gpm-spray rate.
   c. Air Leakage Rate: Maximum 0.05 cfm/sq. ft.
2. Daylighting: Provide daylighting photometric performance comparable to basis-of-design product at layout indicated, based on daylighting profile of March 21, 9:00 am local time, at Project location by simulation in accordance with IESNA guidelines.
3. Air Infiltration: Maximum air leakage through tested size of 0.05 cfm/sq. ft. of fixed area, in accordance with ASTM E 283 at static-air-pressure differential of 1.57 lbf/sq. ft.
4. Water Penetration under Static Pressure: No evidence of water penetration through unit when tested according to ASTM E 331 at static-air-pressure differential of 4.6 lbf/sq. ft.
5. Dome Burn Rate: CC1in accordance with ASTM D 635.
6. Dome Smoke Density Rating: 75 or less in accordance with ASTM D 2843.

7. Dome Self-Ignition Temperature: 650 deg F or greater in accordance with ASTM D 1929.
8. Dome Hail Resistance: Pass; 2.0-inch-diameter ice balls and smaller in accordance with FM 4430.
9. Fall Protection Standard Compliance: 29 CFR 1910.23: Skylight tested to support a minimum of 400 lb over 1 sq. ft. of the surface.

2.3 ACCESSORY MATERIALS

A. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.

1. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil-dry film thickness per coat.

2.4 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.

B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.

C. Install unit skylights level, plumb, and true to line, without distortion.

D. Anchor unit skylights securely to supporting substrates.

E. Where aluminum surfaces of unit skylights will contact another metal or corrosive substrates, such as preservative-treated wood, apply bituminous coating on concealed metal surfaces or provide other approved permanent separation recommended in writing by unit skylight manufacturer.

3.3 CLEANING

A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.

B. Remove excess sealants, glazing materials, dirt, and other substances.

C. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

END OF SECTION 086200

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SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed extruded-aluminum louvers.
2. Blank-off panels for louvers

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing according to AMCA 500-L.

F. Windborne-Debris-Impact-Resistant Louver: Louver that provides specified windborne-debris-impact resistance, as determined by testing according to AMCA 540.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Sample Warranties: For manufacturer's special warranties.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 WARRANTY

A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.2 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Drainable-Blade Louver:

1. Basis of Design: Subject to compliance with requirements, provide K6776 by The Airolite Company or a comparable product by one of the following:

a. Airolite Company, LLC (The).
b. American Warming and Ventilating; a Mestek Architectural Group company.
c. Reliable Products, Inc.
d. United Enertech.

2. Louver Depth: 6 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
4. Mullion Type: Concealed.
5. Blade Profile: Plain blade without center baffle.
6. Color: To be determined.
7. Louver Performance Ratings:

a. Free Area: Minimum 50 percent.
b. Point of Beginning Water Penetration: Not less than 950 fpm.
c. Air Performance: Not more than 0.15-inch wg static pressure drop at 950-fpm free-area intake velocity.

8. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.3 LOUVER SCREENS

A. General:

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/4-inch- square mesh, 0.063-inch wire.

2.4 BLANK-OFF PANELS

A. Insulated Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver. Provide blank-off panel at each exterior louver unless noted otherwise.

1. Thickness: 1 inch.
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
3. Insulating Core: extruded-polystyrene foam.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
6. Panel Finish: Same type of finish applied to louvers, but black color.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
2. Horizontal Mullions: Provide horizontal mullions at joints where indicated.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.8 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range including custom colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include Limiting Heights Table for each application.
2. For partitions requiring seismic bracing, submit coordinated set of partition anchorage drawings prior to installation including:

a. Description, layout, and location of items to be anchored or braced with anchorage or brace points noted and dimensioned.
b. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, and welds clearly identified.
c. Numerical value of design seismic brace loads.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For embossed, high-strength steel studs and tracks, firestop tracks, post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Notify manufacturer of damaged materials received prior to installation.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design framing systems in accordance with AISI S220, "North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members," unless otherwise indicated.

B. Design Loads: As indicated on architectural Drawings or 5 lbf/sq. ft. minimum as required by the IBC.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with and AISI S220for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 and AISI S220requirements for steel unless otherwise indicated.
2. Protective Coating: Comply with ASTM C645; ASTM A653/A653M, G40; or coating with equivalent corrosion resistance. Galvannealed products are unacceptable.

a. Coating demonstrates equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction.

B. Studs and Tracks: ASTM C645.

1. Conventional Steel Studs and Runners:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Formetal Company, Inc.
2) Phillips Manufacturing Co.
3) Steel Network, Inc. (The).
4) Telling Industries.

b. Minimum Base-Steel Thickness: As indicated in manufacturer's published "Limiting Heights" tables based on the following criteria, but not less than 0.0269 inch and 0.0296 for tile backing panels.

1) Yield Strength of steel.
2) Deflection Limits:

a) Gypsum Wallboard: L/240.
b) Ceramic Tile: L/360.
c) Plaster: L/360.

3) Limiting heights: As indicated on Drawings.
4) Spans: as indicated on Drawings or as recommended by manufacturer.
5) Applied loads, composite or non-composite construction, as appropriate:

a) Gypsum wallboard: 5 psf.
b) Ceramic tile, one side: 15 psf.
c) Ceramic tile, two sides: 30 psf.
d) Gypsum plaster, one side: 15 psf.
e) Gypsum plaster, two sides: 30 psf.

c. Depth: As indicated on Drawings.

2. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional ASTM C645 steel studs and tracks.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) ClarkDietrich Building Systems.
2) Marino\WARE.

3) Phillips Manufacturing Co.
4) Steel Network, Inc. (The).
5) Telling Industries.

b. Minimum Base-Steel Thickness: Of equivalent thickness to conventional studs and runners, based on criteria above, and validated by independent, qualified third party testing..
c. Depth: As indicated on Drawings.

C. Radius Track: Proprietary segmented interlocking tracks designed to create curved partitions and arches. Minimum base metal thickness equal to studs.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ClarkDietrich Building Systems: Contour Track.
b. Flexibility Concepts; Flex-C-Track.
c. The Steel Network; Circle Trak.
d. Radius Track Corporation; Ready-Track.

2.3 FRAMING ACCESSORIES

A. Manufacturers: Unless indicated otherwise, provide framing accessories manufactured or approved by the manufacturer of the basic framing system.

B. Slip-Type Head Joints: Provide one of the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch minimum vertical movement.
2. Single Long-Leg Track System: ASTM C645 top track with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
3. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Subject to compliance with requirements, provide one of the following:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
2) MBA Building Supplies; Slotted Deflecto Track.
3) Steel Network Inc. (The); VertiClip SLD Series.
4) Superior Metal Trim; Superior Flex Track System (SFT).
5) Telling Industries; Vertical Slip Track.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Steel Thickness: 0.0329 inch.

D. Backing Plates (Contractor's Option): In lieu of flat steel straps provide ClarkDietrich Danback fire-retardant treated flexible wood backing plate system for the attachment of cabinets, handrails, wall fixtures.

E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Minimum Base-Steel Thickness: 0.0296 inch.
2. Depth: As indicated on Drawings.

G. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

2.4 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

B. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

C. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.

D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
2. Steel Studs and Tracks: ASTM C645.
    a. Minimum Base-Steel Thickness: 0.0269 inch.
    b. Depth: 3-5/8 inches.
3. Embossed, High-Strength Steel Studs and Tracks: ASTM C645.
    a. Minimum Base-Steel Thickness: Not less than 0.0190 inch.
    b. Depth: As indicated on Drawings.
4. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.
    a. Minimum Base-Steel Thickness: Not less than 0.0296 inch.

E. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Armstrong World Industries, Inc; Drywall Grid Systems.
    b. USG Corporation; Drywall Suspension System.

F. Suspension Systems for Gypsum Board Ceilings: System consisting of single runners that span width of corridors up to 7 feet without hanger wires and up to 14 feet with one hanger wire and are supported by wall angles. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Chicago Metallic Corporation; SpanFast Drywall Suspension System.
2. USG Corporation; Drywall Wall-to-Wall Suspension System.

2.5 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. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

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 non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
3. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum ceiling board.
2. Interior trim.
3. Joint treatment materials.

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 each type of 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. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.3 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.

2.4 INTERIOR GYPSUM BOARD

A. Gypsum Ceiling Board: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. American Gypsum Company.
    b. CertainTeed.
    c. Georgia-Pacific.
    d. National Gypsum Co.
    e. Pabco Gypsum.
    f. US Gypsum Company.
2. Thickness: 1/2 inch.
3. Long Edges: Tapered.

2.5 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.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.7 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 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

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. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

H. 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.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. 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. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated on Drawings.
4. U-Bead: Use where indicated on Drawings.

3.5 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, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Where indicated on Drawings.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermoset-rubber base.
2. Thermoplastic-rubber base.
3. Rubber molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.
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. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Flooring.
2. Flexco.
3. Johnsonite, Inc.
4. Nora Systems, Inc.
5. Roppe Corp.
6. Tarkett USA Inc.

B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:

a. Style B, Cove: Provide in areas with resilient floor coverings.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As indicated in Interior Finish Legend on Drawings.

2.2 THERMOPLASTIC-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Flooring.
2. Flexco.
3. Johnsonite, Inc.
4. Nora Systems, Inc.
5. Roppe Corp.
6. Tarkett USA Inc.

B. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style B, Cove: Provide in areas with resilient floor coverings.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As indicated in Interior Finish Legend on Drawings.

2.3 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Flooring.
2. Flexco.
3. Johnsonite, Inc.
4. Nora Systems, Inc.
5. Roppe Corp.
6. Tarkett USA Inc.

B. Description: Rubber nosing for resilient floor covering, reducer strip for resilient floor covering and transition strips.

C. Profile and Dimensions: As indicated on Drawings.

D. Locations: Provide rubber molding accessories in areas indicated.

E. Colors and Patterns: As indicated in Interior Finish Legend on Drawings.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

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SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates.

B. Related Requirements:

1. Section 055213 "Pipe and Tube Railings" for shop painting pipe and tube railings.
2. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.
3. Section 099600 "High-Performance Coatings" for tile-like coatings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.

3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. Diamond Vogel Paints.
3. PPG Paints.
4. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
5. Sherwin-Williams Company (The) (Basis-of-Design).

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.
d. Metal conduit.
e. Plastic conduit.
f. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates: Exposed steel as indicated on Drawings.

1. Water-Based Light Industrial Coating System MPI EXT 5.1C:

a. Prime Coat: Shop primer specified in Section where substrate is specified.
b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
c. Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.

1) Benjamin Moore; Ultra spec HP, DTM 100% Acrylic Latex Gloss.
2) PPG Architectural; Devoe Coatings, Devflex 4206 QD Interior/Exterior Waterborne Semi-Gloss.
3) PPG Architectural; High Performance Coatings, Pitt-Tech Plush, Interior/Exterior Semi-Gloss DTM Industrial Enamel, 548901.
4) Sherwin Williams: Pro Industrial, DTM Semi-Gloss, B66W01151..

B. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System MPI EXT 5.3J:

a. Prime Coat: Primer, galvanized, water based, MPI #134.

1) Benjamin Moore: Supre Spec HP Acrylic Metal Primer P04/KP04.
2) PPG Architectural: High Performance Coatings, 100% Acrylic DTM Industrial Primer.
3) Sherwin-Williams; Protective and marine DTM Acrylic Primer/Finish.

b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.

1) Benjamin Moore; Ultra spec HP, DTM 100% Acrylic Latex Gloss.
2) PPG Architectural; Devoe Coatings, Devflex 4206 QD Interior/Exterior Waterborne Semi-Gloss.
3) Sherwin Williams: Pro Industrial, DTM Acrylic, B66W01251.

C. Aluminum Substrates:

1. Water-Based Light Industrial Coating System MPI EXT 5.4G:

a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.

1) Rust-Oleum: Zinsser Allprime Oil Base Primer Sealer & Stain Blocker (Int/Ext) 3650/51/54.

b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
c. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 5), MPI #163.

1) Benjamin Moore; Ultra spec HP, DTM 100% Acylic Latex Gloss.
2) PPG Architectural; Devoe Coatings, Devflex 4206 QD Interior/Exterior Waterborne Semi-Gloss.
3) PPG Architectural; High Performance Coatings, Pitt-Tech Plush, Interior/Exterior Semi-Gloss DTM Industrial Enamel, 548901.
4) Sherwin Williams: Pro Industrial, DTM Acrylic, B66W01251.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Primers.
2. Water-based finish coatings.
3. Floor sealers.
4. Dry fall coatings.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples: For each type of topcoat product.

C. Product Schedule: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.3 CLOSEOUT SUBMITTALS

A. Coating Maintenance Manual: Upon completion of the Project, submit a coating maintenance manual.

1. The manual shall include the following information:

a. A coating finish schedule designating where each product/color/finish was used.
b. Mix formulas for each color used.
c. Product data pages.
d. Material Safety Data Sheets.
e. Care and cleaning instructions.
f. Touch-up procedures.
g. Color sample of each color and finish used.

1.4 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. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. PPG Paints.
3. Sherwin-Williams Company (The) (Basis-of-Design).

B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated found at the end of Part 3.

C. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 PAINT PRODUCTS, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As indicated on Finish Schedule on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7/NACE No. 4.
4. SSPC-SP 11.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 INSTALLATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Back-Rolling: Back roll all spray applications on walls and ceilings to allow for touch up.

F. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:
    a. Hot- and cold-water piping; fire-suppression piping.
2. Paint the following work where exposed in occupied spaces:
    a. Hot- and cold-water piping; fire-suppression piping.

3.4 FIELD QUALITY CONTROL

A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

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 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Traffic Surfaces:

1. Water-Based Concrete Floor Sealer System:

a. First Coat: Matching topcoat.
b. Topcoat: Water-based concrete floor sealer.

1) Products: Subject to compliance with requirements, provide one of the following:

a) ARDEX Americas; ARDEX CG Concrete Guard.
b) Benjamin Moore Insl-X Tuffcrete Wb Acrylic Waterproofing Concrete Stain Cst-2100 Clear
c) Euclid Chemical; Diamond Clear VOX.
d) PPG Paints; Perma-Crete Plex-Seal WB Int/Ext Clear Sealer, 4-6200.
e) Sherwin-Williams; H&C Clarishield Wet Look Sealer; 50.148154.

2. Penetrating Concrete Floor Sealer: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dayton Superior; Sure Hard Densifier J17.
2) Euclid Chemical; Euro Diamond Hard.
3) L & M Construction Chemicals, Inc.; Laticrete Seal Hard.
4) Meadows, W.R. Inc.; Liqui-Hard.
5) Sherwin-Williams; H&C Clear Liquid Hardener & Densifier.

B. CMU Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Block Filler: Interior/exterior latex block filler.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore: Ultra Spec Hi-Build Masonry Block Filler, 571.
b) PPG Paints: Speedhide Int/Ext Acrylic Masonry Hi-Fill Block Filler Latex, 6-15XI.
c) Sherwin-Williams; PrepRite Int/Ext Block Filler, B25W25.

b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior, latex, institutional low odor/VOC, eggshell.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec 500 Interior Eggshell, T538.
b) PPG Paints; Speedhide Zero Interior Zero-VOC Eggshell, 6-4310XI.
c) Sherwin-Williams; ProMar 200 HP Zero VOC Interior Acrylic Eg-Shel, B20W01951.

d. Topcoat: Interior, latex, institutional low odor/VOC, semigloss.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec 500 Interior Gloss Finish, N540.
b) PPG Paints; Speedhide Zero Interior Zero-VOC Latex Semi Gloss, 6-4510XI.
c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.

2. (Epoxy System) Water-Based Light-Industrial Coating System:

a. Block Filler: Interior/exterior latex block filler.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore: Ultra Spec Hi-Build Masonry Block Filler, 571/K571.
b) PPG Paints; Speedhde Int./Ext. Masonry Hi Fill Latex Block Filler, 6-15 XI.
c) Sherwin-Williams; Pro Industrial Heavy Duty Block Filler, B42W00150.

b. Intermediate Coat: Matching topcoat.
c. Topcoat; Interior Pre-Catalyzed Epoxy, eggshell (Gloss Level 3):

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Corotech Pre Catalyzed Waterborne Epoxy Eggshell, V342.
b) PPG Paints; Pitt-Glaze WB1 Int Eggshell Pre-Catalyzed Water-borne Acrylic Epoxy, 16-310 Series.
c) Sherwin-Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45W01151 Series.

d. Topcoat; Interior Pre-Catalyzed Epoxy, semi-gloss (Gloss Level 5):

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Corotech Pre Catalyzed Waterborne Epoxy Semi-Gloss, V341.
b) PPG Paints; Pitt-Glaze WB1 Interior Semi-Gloss Pre-Catalyzed Water-borne Epoxy, 16-510 Series.
c) Sherwin-Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46W01151.

C. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Water-based rust-inhibitive primer.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec HP Acrylic Metal Primer, HP04.
b) PPG Paints; Pitt-Tech Int/Ext DTM Industrial Primer, 90-712.
c) Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer, B66W01310.

b. Intermediate Coat: Matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5).

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec 500 Interior Semi-Gloss Finish, N539.
b) PPG Paints; Speedhide Zero Interior Zero-VOC Latex Semi Gloss, 6-4510XI.
c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.

2. Water-Based Dry-Fall System:

a. Prime Coat: Shop primer specified in Section where substrate is specified.
b. Topcoat: Dry fall, latex, flat.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Latex Dry Fall – Flat, 395.
b) PPG Paints; Speedhide Super Tech WB Interior Dry Fog Flat Latex, 6-725XI.
c) Sherwin-Williams; Pro Industrial Waterborne Acrylic Dryfall, B42W00181.

D. Galvanized-Metal Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Water-based galvanized primer.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec HP Acrylic Metal Primer, HP04.
b) PPG Paints; Pitt-Tech Plus 4020 PF, 4020.
c) Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer, B66W1310 Series.

b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior, latex, institutional low odor/VOC, semigloss.
d. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5).

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec 500 Interior Gloss Finish, N540.
b) PPG Paints; Speedhide Zero Interior Zero-VOC Latex Semi Gloss, 6-4510XI.
c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.

E. Wood Substrates: Architectural woodwork.

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, latex, for interior wood.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Insl-X Prime All Multi-Surface Latex Primer Sealer (AP-1000).
b) PPG Paints; Seal Grip Int/Ext Acrylic Universal Primer/Sealer 17-921XI Series.
c) Sherwin-Williams; PrepRite ProBlock Primer Interior Exterior Sealer, B51W00620.

b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5).

a) Benjamin Moore; Ultra Spec 500 Interior Gloss Finish, N540.
b) PPG Paints; Speedhide Zero Interior Zero-VOC Latex Semi Gloss, 6-4510XI.
c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.

F. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec 500 Zero VOC Primer, N534.
b) PPG Paints; Speedhide Interior Latex Sealer Quick Drying, 6-2.
c) Sherwin-Williams; ProMar 200 Latex Primer, B28W02600.

b. Intermediate Coat: Matching topcoat.

c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1).

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec 500 Interior Flat Finish, N536.
b) PPG Paints; Speedhide Zero Interior Zero-VOC Flat, 6-4110XI.
c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series.

d. Topcoat: Latex, interior, institutional low odor/VOC, eggshell (MPI Gloss Level 3).

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec 500 Interior Eggshell, N537.
b) PPG Paints; Speedhide Zero Interior Zero-VOC Eggshell, 6-4310XI.
c) Sherwin-Williams; ProMar 200 Zero VOC Interior Eg-Shel Latex, B20-2600 Series.

e. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5).

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Ultra Spec 500 Interior Semi-Gloss Finish, N539.
b) PPG Paints; Speedhide Zero Interior Zero-VOC Latex Semi Gloss, 6-4510XI.
c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series.

2. (Epoxy System) Water-Based Light-Industrial Coating System:

a. Prime Coat: Interior latex primer sealer.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Eco Spec WB Interior Latex Primer, N372.
b) PPG Paints; Speedhide Interior Latex Sealer Quick Drying, 6-2.

c) Sherwin-Williams; ProMar 200 Latex Primer, B25W2600.

b. Intermediate Coat: Matching topcoat.

c. Topcoat; Interior Pre-Catalyzed Epoxy, eggshell, (Gloss Level 3):

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Corotech Pre Catalyzed Waterborne Epoxy Eggshell, V342.
b) PPG Paints; Pitt-Glaze WB1 Interior Eggshell Pre-Catalyzed Water-borne Epoxy, 16-310 Series.
c) Sherwin-Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45-150 Series.

d. Topcoat; Interior Pre-Catalyzed Epoxy, semi-gloss, (Gloss Level 5):

1) Products: Subject to compliance with requirements, provide one of the following:

a) Benjamin Moore; Corotech Pre Catalyzed Waterborne Epoxy Semi-Gloss, V341.
b) PPG Paints; Pitt-Glaze WB1 Interior Semi-Gloss Pre-Catalyzed Water-borne Epoxy, 16-510 Series.
c) Sherwin-Williams; Pro Industrial Pre-Cat Epoxy Semi-Gloss, K46-150 Series.

END OF SECTION 099123

SECTION 102113.17 - PHENOLIC-CORE TOILET COMPARTMENT DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Phenolic-core toilet compartment doors.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for blocking.
2. Section 092216 "Non-Structural Metal Framing" for blocking.
3. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

A. Coordinate requirements for blocking, reinforcing, and other supports concealed within wall to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data.

1. Phenolic-core toilet compartment doors.

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartment doors.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of floor drains.

C. Samples: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: One hinge with associated fasteners.
2. Latch and Keeper: One latch and keeper with associated fasteners.
3. Door Bumper: One door bumper with associated fasteners.
4. Door Pull: One door pull with associated fasteners.
5. Fasteners: 10 fasteners of each size and type.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain phenolic-core toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:

1. Panels are able to withstand a concentrated load on grab bar of at least 250 lbf applied at any direction and at any point, without deformation of panel.

C. Regulatory Requirements: Comply with applicable provisions in the USDOJ's "2017 ADA Standards for Accessible Design" and ICC A117.1 for toilet compartments designated as accessible.

2.3 PHENOLIC-CORE TOILET COMPARTMENTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but not limited to, the following:

1. ASI Accurate Partitions (ASI American Specialties, Inc.; ASI Group).
2. Bobrick.
3. Bradley Corporation.
4. General Partitions.
5. Partition Systems International of South Carolina (PSISC).

B. Door: Solid phenolic-core material with melamine facing on both sides fused to substrate during manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch- thick.

C. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, stainless steel.

D. Phenolic Compartment Finish: One color in each room.

1. Dark-Core Phenolic: Manufacturer's standard dark color core and edge.

a. Facing Sheet Color: As selected by Architect from manufacturer's full range.

2.4 HARDWARE AND ACCESSORIES

A. Door Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty institutional operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch- thick, stainless steel, paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through bolts.
2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible. Mount with through bolts.
3. Coat Hook: Manufacturer's heavy-duty, combination cast stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast stainless steel bumper at outswinging doors. Mount with through bolts.
5. Door Pull: Manufacturer's heavy-duty, cast stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible. Mount with through bolts.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 MATERIALS

A. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

B. Stainless Steel Castings: ASTM A743/A743M.

2.6 FABRICATION

A. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, inswinging doors for standard toilet enclosures and 36-inch- wide, outswinging doors with a minimum 32-inch- wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Stirrup Brackets: Secure panels or screens to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.

a. Align brackets at pilasters with brackets at walls.

B. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.17

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Hand dryers.
3. Custodial accessories.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Public-use washroom accessories.
2. Hand dryers.
3. Custodial accessories

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

C. Samples: For each exposed product and for each finish specified, full size.

1. Approved full-size Samples will be returned and may be used in the Work.

D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain each type of public-use washroom accessory from single source from single manufacturer.

B. Toilet Tissue (Roll) Dispenser **(TP)**: Owner Furnished and Contractor Installed.

C. Waste Receptacle **(TR)**: Owner Furnished and Contractor Installed.

D. Soap Dispenser **(SD)**: Owner Furnished and Contractor Installed.

E. Grab Bar **(GB-1 through GB-3)**:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc.
c. Bradley Corp.

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin Disposal Unit **(ND)**: Owner Furnished and Contractor Installed.

G. Mirror Unit **(MI)**:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc.
c. Bradley Corp.

2. Frame: Stainless steel angle, 0.05 inch thick.

a. Corners: Welded and ground smooth.

3. Size: As indicated on Drawings.
4. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

H. Hook **(CH)**:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bobrick Washroom Equipment, Inc.
b. Bradley Corp.
c. Plumberex.
d. Truebro.

2. Description: Single-prong unit.
3. Mounting: Concealed.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.3 HAND DRYERS

A. Source Limitations: Obtain hand dryers from single source from single manufacturer.

B. Warm-Air Dryer **(HD)**:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Excel Dryer Inc.
b. World Dryer.
c. Bobrick Washroom Equipment, Inc.

2. Description: Standard-speed, warm-air hand dryer.
3. Mounting: Surface mounted.

a. Protrusion Limit: Installed unit protrudes maximum 4 inches from wall surface.

4. Operation: Touch-button or Infrared-sensor activated with timed power cut-off switch.

a. Automatic Shutoff: At 40 seconds.

5. Maximum Sound Level: 63 dB.
6. Cover Material and Finish: Steel, with white enamel finish.
7. Electrical Requirements: 115 V, 13 A, 1500 W.

2.4 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Custodial Mop and Broom Holder **(MH)**:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bobrick Washroom Equipment, Inc.
   b. Bradley Corp.
   c. Plumberex.
   d. Truebro.

2. Description: Unit with mop and broom holders.
3. Length: 36 inches.
4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.5 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch-minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 102800

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SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:

a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.

b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Activar Construction Products Group, Inc.
b. JL Industries.
c. Larsen's Manufacturing Company.
d. Potter Roemer LLC; a Division of Morris Group International.

2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container <**Insert drawing designation**>: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Activar Construction Products Group, Inc.
b. JL Industries.
c. Larsen's Manufacturing Company.
d. Potter Roemer LLC; a Division of Morris Group International.

2. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

1. Mounting Height: Top of fire extinguisher to be at 42 inches above finished floor.

END OF SECTION 104416

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SECTION 310513 - SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Subsoil materials.
2. Topsoil materials.

1.2 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations.
   1. Additional Excavation: Excavation below subgrade elevations as directed by Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
   1. Rock Excavation, Trench: Late-model, track-mounted hydraulic excavator; equivalent to Caterpillar Model N, 235D LC; measured according to SAE J-1179.

2. Rock Excavation, Mass: Late-model, track-mounted loader with a hydraulically operated power ripper; equivalent to Caterpillar Model No. D-8N, Heavy Duty; measured according to SAE J-732.
3. This classification does not include materials such as loose rock, concrete, or other materials that can be removed by means other than drilling and blasting, but which for any reason, such as economic reasons, the Contractor chooses to remove by drilling and blasting.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

L. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

M. Unsatisfactory Soils: Soils located below the design subgrade elevation and in excess of the topsoil striping, which are determined unsatisfactory by the geotechnical engineer.

N. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 QUALITY ASSURANCE

A. Furnish each subsoil and topsoil material from single source throughout Work.

B. Perform Work according to SCDHEC, SCDOT, and local municipality standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Subsoil:

1. Satisfactory Soils:

a. Excavated and reused material, imported borrow, select or local borrow, structural.
b. Graded.

c. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
d. Plasticity index of 20 or less.
e. Maximum dry density of at least 90 pounds per cubic feet when tested by the Standard Proctor Method (ASTM D698).
f. Comply with ASTM D2487 Group Symbol GW, GP, ML, SW, SP, and SM.

B. Topsoil:

1. Satisfactory Soils:

a. Excavated and reused material.
b. Graded and single screened.
c. Free of roots, rocks larger than ½ inch, subsoil, debris, large weeds, and foreign matter.
d. Comply with ASTM D2487 Group Symbol OH, PT, SM, and ML.

2. Satisfactory Soils:

a. Imported borrow.
b. Friable loam.
c. Reasonably free of roots, rocks larger than ½ inch, subsoil, debris, large weeds, and foreign matter.
d. Single screened.
e. pH: 5.5 to 7.5.
f. Inorganic Material: Minimum 4 percent and maximum 25 percent.
g. Comply with ASTM D2487 Group Symbol OH, PT, SM, and ML.

2.2 SOURCE QUALITY CONTROL

A. Testing and Analysis:

1. Subsoil Material: Comply with ASTM D698.
2. Topsoil Material: Comply with ASTM D698.
3. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation:

1. Excavate subsoil and topsoil from designated areas.
2. Strip topsoil to full depth of topsoil in designated areas.
3. Remove excess excavated materials, subsoil, and topsoil not intended for reuse from Site.

4. Remove excavated materials not meeting requirements for subsoil and topsoil materials from Site.

B. Stockpiling:

1. Stockpile excavated material meeting requirements for subsoil and topsoil materials.
2. Stockpile materials on Site at locations as designated by Engineer.
3. Stockpile in sufficient quantities to meet Project schedule and requirements.
4. Separate differing materials with dividers or stockpile apart to prevent intermixing of soil types or contamination.
5. Stockpile topsoil maximum 10 feet high.
6. Direct surface water away from stockpile to prevent erosion or deterioration of materials.
7. Stockpile hazardous materials on impervious material and cover to prevent erosion and leaching until they are disposed.

3.2 CLEANING

A. Stockpile:

1. Remove stockpile and leave area in clean and neat condition.
2. Grade Site surface to prevent freestanding surface water.

END OF SECTION 310513

SECTION 310516 - AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Coarse aggregate materials.
2. Fine aggregate materials.

1.2 SUBMITTALS

A. Product Data: Submit name of imported materials source.

B. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout Work.

B. Perform Work according to SCDOT and local municipality standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Coarse Aggregate:

1. Comply with SCDOT standard.

2. Gravel:

a. Description: Coarse stone, crushed, gravel.
b. Washed Stone: Pit run, angular crushed, natural.
c. Quality: Free of shale, clay, friable material, and debris.
d. Grading:

1) Comply with ASTM C136/C136M and ASTM D2487; Group Symbol GW, GP, GM, and GC.

2) Percent Passing According to Sieve Size:

a) 2 Inches: 100.
b) 1 Inch: 95.

c) 3/4 Inch: 95 to 100.
d) 5/8 Inches: 75 to 100.
e) 3/8 Inches: 55 to 85.
f) No. 4: 35 to 60.
g) No. 16: 15 to 35.
h) No. 40: 10 to 25.
i) No. 200: 5 to 10.

3. Pea Gravel:

a. Description: Pea Gravel.
b. Stone: Natural and washed.
c. Quality: Free of clay, shale, and organic matter.
d. Grading:

1) Comply with ASTM C136/C136M and ASTM D2487; Group Symbol GM and GC.
2) Minimum Size: 1/4 inch.
3) Maximum Size: 5/8 inch.

B. Fine Aggregate:

1. Comply with SCDOT standard.

2. Sand:

a. Description: Natural river or bank sand**,** washed.
b. Quality: Free of silt, clay, loam, friable or soluble materials, and organic matter.
c. Grading:

1) Comply with ASTM C136/C136M and ASTM D2487; Group Symbol SW, SP, SM, and SC.
2) Percent Passing According to Sieve Size:

a) No. 4: 100.
b) No. 14: 10 to 100.
c) No. 50: 5 to 90.
d) No. 100: 4 to 30.
e) No. 200: Zero.

2.2 SOURCE QUALITY CONTROL (COORDINATE W/2.2, 2.3, & 2.4)

A. Testing and Analysis:

1. Coarse-Aggregate Material: Comply with ASTM C136/C136M and ASTM D698.
2. Fine Aggregate Material - Testing and Analysis: Perform according to ASTM C136/C136M and ASTM D698.

3. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation:

1. Excavate aggregate materials from Site locations as indicated and as specified in Section 312213 – Rough Grading, 312316 – Excavation, and 312316.13 – Trenching.
2. Remove excess excavated coarse-aggregate and fine-aggregate materials not intended for reuse from Site.
3. Remove excavated materials not meeting requirements for coarse aggregate and fine aggregate from Site.

B. Stockpiling:

1. Stockpile materials on Site at locations as designated by Engineer.
2. Stockpile excavated material meeting requirements for coarse-aggregate and fine-aggregate materials.
3. Stockpile in sufficient quantities to meet Project schedule and requirements.
4. Separate different aggregate materials with dividers or stockpile apart to prevent intermixing of aggregate types or contamination.
5. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
6. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching until they are disposed.

3.2 CLEANING

A. Stockpile:

1. Remove stockpile and leave area in clean and neat condition.
2. Grade Site surface to prevent freestanding surface water.

END OF SECTION 310516

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SECTION 310519.13 - GEOTEXTILES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Turf reinforcement mats (TRMs).
2. Nonwoven geotextile material.

1.2 SUBMITTALS

A. Product Data: Manufacturer information including tensile strength, elongation, thickness, UV resistance, and other material specifications.

B. Shop Drawings: Fabric layout, seam locations, and overlap details in installation drawings.

C. Manufacturer's Certificate: Products meet or exceed specified requirements.

D. Manufacturer Instructions: Installation requirements, including storage and handling procedures.

E. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

G. Qualifications Statements:

1. Qualifications for manufacturer and installer.
2. Manufacturer's approval of installer.

1.3 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of geotextile material, including placement depth.

1.4 QUALITY ASSURANCE

A. Perform work according to governing agency standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM D4873.

B. Store materials according to manufacturer instructions.

C. 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 TRM

A. Manufacturers:

1. Furnish materials according to governing agency standards, or as directed in plans.

2.2 NONWOVEN GEOTEXTILE MATERIALS

A. Manufacturers:

1. Furnish materials according to governing agency standards.

2.3 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of completed assembly.

B. 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. Verify that underlying surface is smooth and free of ruts or protrusions that could damage geotextile material.

3.2 PREPARATION

A. Subgrade Material and Compaction Requirements: As specified in Section 312316.13 – Trenching and 312323 – 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: 12 inches.

B. Securement Pins:

1. Insert through geotextile midway between edges of overlaps and minimum 2 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: 18 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 2 horizontal.
    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 indicated and 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. Testing: According to ASTM D4354.

B. Equipment Acceptance: Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.

3.5 PROTECTION

A. Ballast: Adequate to prevent uplift of material by wind.

B. UV Exposure: Do not leave material uncovered for more than 14 days after installation.

C. Do not use staples or pins to hold geotextiles in place where located adjacent to other geosynthetic layers that could be damaged.

D. Do not operate equipment directly on top of geotextile.

END OF SECTION 310519.13

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removing surface debris.
2. Removing designated paving, curbs, and concrete.
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned utilities.

1.2 QUALITY ASSURANCE

A. Conform to applicable code for environmental requirements and disposal of debris.

B. Perform Work according to SCDHEC standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Except for materials indicated to be stockpiled or to remain Owner’s property, cleared materials shall become contractor’s property and shall be removed from the site.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing plant life designated to remain is tagged or identified.

B. Identify waste area for placing removed materials.

3.2 PREPARATION

A. Call local utility line information service at 811 not less than three **(**3) working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Protect and maintain benchmarks and survey control points from disturbance during construction.

C. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Locate and clearly flag trees and vegetation to remain or to be relocated.

E. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain from damage.

B. Protect bench marks, 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 6 inches.

B. Remove trees and shrubs within areas indicated on the plans. Remove stumps, main root ball, root system to depth of 18 inches, and surface rock.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Use only hand methods for grubbing within drip line of remaining trees.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from Site.

B. Remove paving, curbs, and concrete, as indicated.

C. Partially remove paving, curbs, and concrete as indicated. Neatly saw cut edges at right angle to surface.

D. Remove abandoned utilities. Indicated removal termination point for underground utilities on record documents.

E. Continuously clean-up and remove waste materials from Site. Do not allow materials to accumulate on Site.

F. Do not burn or bury materials on Site. Leave Site in clean condition.

END OF SECTION 311000

SECTION 312213 - ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring, and compacting, Site for Site structures, building pads, parking areas, and drives.

1.2 SUBMITTALS

A. Product data, if applicable.

1. Drainage fabric.
2. Geosynthetics.

B. Materials Source: Name of imported materials suppliers, if applicable.

C. Manufacturer's Certificate: Products meet or exceed specified requirements.

D. Test Reports: Submit test reports indicating suitability of all materials proposed to be supplied from off-site.

1.3 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.4 QUALITY ASSURANCE

A. Perform Work according to ASTM C136, ASTM D2419, and ASTM D2434.

B. Perform Work according to SCDOT standards, within road right-of-way.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Satisfactory soils as specified in Section 310513 – Soils for Earthwork.

B. Subsoil Fill: Satisfactory soils as specified in Section 310513 – Soils for Earthwork.

C. Structural Fill: Satisfactory soils as specified in Section 310513 – Soils for Earthwork.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify survey bench mark and intended elevations for Work are as indicated.

3.2 PREPARATION

A. Call local utility line information service at 811 not less than three (3) 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 owner to remove and/or relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, and other features remaining as portion of final landscaping.

F. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

A. Remove sod and grass before stripping topsoil.

B. Excavate topsoil from entire Site without mixing with foreign materials for use in finish grading.

C. Do not excavate wet topsoil.

D. Stockpile in area designated on Site to depth not exceeding ten (10) feet and protect from erosion.

E. Do not remove topsoil 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 4:1 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 fill material in continuous layers and compact according to schedule at end of this Section.

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 feet, 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.

G. Install Work according to SCDOT standards, within road right-of-way.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.7 APPROVAL OF SUBGRADE

A. Notify Architect and Testing Agency when excavations have reached required subgrade.

B. If Architect or Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

C. Proof roll subgrade with heavy pneumatic-tired equipment with a minimum loaded weight of 25 tons to identify soft pockets and areas in excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities and retest, as directed by Architect.

3.8 FIELD QUALITY CONTROL

A. Perform laboratory material tests according to ASTM D698.

B. Perform in place compaction tests according to following:

1. Density Tests: ASTM D1556, ASTM D2167, and/or ASTM D2922, as applicable.
2. Moisture Tests: ASTM D3017.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests: once per lift of backfill.

3.9 SCHEDULES

A. Structural Fill (within limits of building pad):

1. To subgrade elevation at 6” thick lifts.
2. Compact uniformly to minimum 98 percent of maximum density.

B. Structural Fill (outside limits of building pad):

1. To subgrade elevation at 6” thick lifts.
2. Compact uniformly to minimum 95 percent of maximum density.

C. Subsoil Fill:

1. To subgrade elevation at 8” thick lifts.
2. Compact uniformly to minimum 95 percent of maximum density.

D. Topsoil Fill:

1. To finished grade at 6” thick.
2. Compact uniformly to minimum 90 percent of maximum density.

END OF SECTION 312213

SECTION 312316 - EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil densification.
2. Excavating for building foundations.
3. Excavating for paving, roads, and parking areas.
4. Excavating for slabs on grade.
5. Excavating for Site structures.
6. Excavating for landscaping.

1.2 SUBMITTALS

A. 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.

B. Shop Drawings: Indicate soil densification grid for each size and configuration footing requiring soils densification.

1.3 QUALITY ASSURANCE

A. Perform Work according to SCDOT standards, within road right-of-way.

B. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of South Carolina.

PART 2 - PRODUCTS

2.1 EXPLOSIVES: Remove identified and discovered rock during excavation with explosives per Section 312316.26 – Rock Removal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Utility Service Locator:

1. Call local utility service-line information at 811 not less than three (3) working days before performing Work.

2. Request that underground utilities be located and marked within and immediately surrounding Site.
3. Identify required lines, levels, contours, and data.

B. Existing Utilities:

1. Notify utility owner to remove and/or relocate utilities.
2. Protect from damage utilities indicated to remain.

B. Protect plant life, lawns, and other features designated to remain as portion of final landscaping.

C. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 SOIL DENSIFICATION BY VIBRO-COMPACTION

A. Description:

1. Vibro-compact substrates below footing bearing surfaces for footings as indicated before excavating Site.
2. Densify existing subsoils with relative density rating of "compact to dense" to attain relative density rating of "very dense."
3. Densify subsoils to depth, as directed by a Geotechnical Engineer.

B. Equipment:

1. Depth Vibrator: Poker type with follower tubes with visible marking every 12 inches to enable insertion depth measurement.
2. Motion: radial in horizontal plane.
3. Eccentric Force, as directed by a Geotechnical Engineer.
4. Data Acquisition System: Record amps or pressure of vibrator motor over time and depth.

C. Procedure:

1. Perform densification in presence of Geotechnical Engineer.
2. Perform densification directly under each footing with vibrator inserted in grid pattern at maximum 6 feet o.c.
3. Arrange compaction grid for each footing for maximum number of insertion points, and with outermost insertion points within bearing area of footings.
4. Adjust compaction grid arrangement and spacing as directed by Geotechnical Engineer to achieve required densification.
5. Insert vibrator to maximum specified depth, densify soils for 30 seconds or other time as directed by Geotechnical Engineer, and withdraw vibrator every 12 inches while repeating densification at each increment.
6. If subsurface obstruction prevents vibrator insertion to specified depth, request instructions from Geotechnical Engineer to compensate for obstruction.

D. Tolerances:

1. Maximum Deviation from Center of Completed Compaction: 8 inches from indicated position.
2. Maximum Deviation from Vertical: 4 degrees during vibrator insertion.

3.3 EXCAVATION

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, contractor shall replace with satisfactory soil materials at no additional cost to the Owner.

B. Underpin adjacent structures which may be damaged by excavation Work.

C. Excavate subsoil to accommodate building foundations, slabs on grade, paving, Site structures, and construction operations.

D. Excavate to working elevation for piling Work.

E. Compact disturbed load-bearing soil in direct contact with foundations to original bearing capacity, as specified in Section 312323 – Fill, and Section 312316.13 – Trenching.

F. Slope banks with machine to angle of repose or less until shored.

G. Do not interfere with 45-degree bearing splay of foundations.

H. Grade top perimeter of excavation to prevent surface water from draining into excavation.

I. Trim excavation and remove loose matter.

J. Removal of Deleterious Materials:

1. Remove lumped subsoil, boulders, and rock up to 1 cu. yd. measured by volume.
2. Remove larger material as specified in Section 312323 – Fill.

K. Notify Engineer of unexpected subsurface conditions.

L. Correct over-excavated areas with structural fill Type as specified in Section 312323 – Fill.

M. Remove excavated material from Site not intended for reuse.

N. Repair or replace items indicated to remain that have been damaged by excavation.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches on each side of pipe or conduit, unless otherwise indicated.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.8 FIELD QUALITY CONTROL

A. Request visual inspection of bearing surfaces by Geotechnical Engineer and/or Engineer before installing subsequent Work.

3.9 PROTECTION

A. Prevent displacement or loose soil from falling into excavation and 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 that may be created by earth operations.

END OF SECTION 312316

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SECTION 312316.13 - TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating trenches for utilities from 5-ft outside building to utility service.
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Backfilling and compaction.

1.2 SUBMITTALS

A. 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.

B. Product Data: Geotextile fabric indicating fabric and construction.

C. Materials Source: Name of imported fill materials suppliers, if applicable.

D. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Perform Work according to SCDOT standards within road right-of-way.

B. Prepare excavation protection plan under direct supervision of professional engineer experienced in design of this Work and licensed in State of South Carolina.

1.4 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.5 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill: Satisfactory soils as specified in Section 310513 – Soils for Earthwork.

B. Structural Fill: Satisfactory soils as specified in Section 310513 – Soils for Earthwork.

C. Granular Fill: Aggregates as specified in Section 310516 – Aggregates for Earthwork.

D. Concrete:

1. Structural concrete as specified in Section 033000 – Cast-In-Place Concrete with compressive strength of 4,000 psi.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, non-woven.

PART 3 - EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated.

1. Engineer may make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call local utility line information service at 811 not less than 3 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, rock outcropping and other features remaining as portion of final landscaping.

D. Protect bench marks, 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 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 utility service.

B. Remove lumped subsoil, boulders, and rock up of 1/6 cu yd, measured by volume. Remove larger material as specified in Section 312316 – Excavation.

C. Perform excavation within 24 inches of existing utility service according to utility owners' requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 24 inches 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 utilities.

H. Do not interfere with 45-degree bearing splay of foundations.

I. When Project conditions permit, slope side walls of excavation starting 24 inches 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 Geotechnical Engineer until suitable material is encountered.

K. 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 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 Geotechnical 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 5 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 sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

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 as directed by Geotechnical Engineer.

D. Place fill material in continuous layers and compact according to schedule at end of this Section.

E. Employ placement method that does not disturb or damage foundation perimeter drainage, utilities in trench, and other site features.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Do not leave any trench open at end of working day.

3.6 TOLERANCES

A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Perform laboratory material tests according to ASTM D698.

B. Perform in place compaction tests according to following:

1. Density Tests: ASTM D1556, ASTM D2167, and/or ASTM D2922, as applicable.
2. Moisture Tests: ASTM D3017.

C. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

D. Frequency of Tests: Once per lift of backfill.

3.8 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.9 SCHEDULE

A. Storm and Sanitary Piping:

1. Cover pipe and bedding with structural fill: To subgrade elevation. 6” thick.
2. Compact uniformly to minimum 95 percent of maximum density.

B. Duct Bank:

1. Cover duct and bedding with structural fill: To subgrade elevation. 6” thick.
2. Compact uniformly to minimum 95 percent of maximum density.

END OF SECTION 312316.13

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SECTION 312316.26 - ROCK REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removing identified and discovered rock during excavation.
2. Expansive tools and Explosives to assist rock removal.

1.2 DEFINITIONS

A. Site Rock: Solid mineral material with volume in excess of 1 cu yd or solid material that cannot be removed with 3/4 cu yd capacity excavator without drilling or blasting. Refer to Section 310513 – Soils for Earthwork for additional information.

B. Trench Rock: Solid mineral material with volume in excess of 3/4 cu yd or solid material that cannot be removed with 3/4 cu yd capacity excavator without drilling or blasting. Refer to Section 310513 – Soils for Earthwork for additional information.

1.3 SUBMITTALS

A. Shop Drawings: Indicate proposed method of blasting, delay pattern, explosive types, type of blasting mat or cover, and intended rock removal method.

B. Survey Report: Conditions of buildings near locations of rock removal.

1.4 QUALITY ASSURANCE

A. Seismic Survey Firm: Licensed company specializing in seismic surveys with five years' experience.

B. Explosives Firm: Company specializing in explosives for disintegration of rock, with five years' experience.

1.5 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.

1.6 SCHEDULING

A. Schedule Work to avoid disruption to occupied buildings nearby.

B. Conduct blasting operations between hours of 9:00 AM and 4:00 PM 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.

D. Mechanical Disintegration Compound: Type recommended by explosives firm.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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. Drill holes and use expansive tools, wedges and/or mechanical disintegration compound to fracture rock.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for footings and foundations.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

E. Remove excavated materials from Site.

F. Correct unauthorized rock removal according to backfilling and compacting requirements of Section 312323 – Fill.

3.4 ROCK REMOVAL BY EXPLOSIVE METHODS

A. When rock is uncovered requiring explosives method for rock disintegration, notify Engineer.

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 footings and foundations.

G. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

H. Remove excavated material from Site.

I. Correct unauthorized rock removal according to backfilling and compacting requirements of Section 312323 – Fill.

3.5 FIELD QUALITY CONTROL

A. Request visual inspection of foundation bearing surfaces by Geotechnical Engineer and/or Engineer before installing subsequent Work.

END OF SECTION 312316.26

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SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface water control system.
2. System operation and maintenance.
3. Water disposal.

1.2 DEFINITIONS

A. Dewatering:

1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations, trenches, tunnels, and shafts.
2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations, trenches, tunnels, and shafts.
3. Disposing of removed water.

B. Piezometer: A tube inserted into a vessel or pipe to indicate the height (pressure) that a liquid can rise in the tube.

C. Pitometer: A measuring device that transforms a differential pressure into an electrical output current proportional to the flow rate.

D. Surface Water Control: The removal of surface water within open excavations.

1.3 SUBMITTALS

A. Product Data:

1. Submit sizes, capacities, priming method, and motor characteristics for dewatering pumps.
2. Submit pumping equipment for control of surface water within excavation.

B. Shop Drawings:

1. Indicate dewatering system layout, well depths, well screen lengths, dewatering pump locations, pipe sizes and capacities, grades, filter sand gradations, surface water control devices, valves, and water disposal method and location.
2. Indicate primary and standby power system location and capacity.

3. Indicate layout and depth of monitoring wells, piezometers, and flow measuring devices for system performance measurement.
4. Include detailed description of dewatering and monitoring system installation procedures and maintenance of equipment.
5. Include description of emergency procedures to follow when problems arise.

C. Delegated Design Submittals:

1. Submit signed and sealed Shop Drawings.
2. Indicate design values, analyses, assumptions, and calculations to support design.
3. Include description and profile of geology, soil, and ground water conditions.

D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations and depths of capped wells and piping abandoned in place.

1.5 QUALITY ASSURANCE

A. Comply with authorities having jurisdiction for following:

1. Drilling and abandoning of wells used for dewatering systems.
2. Water discharge and disposal from pumping operations.

B. Obtain permit from SCDHEC under National Pollutant Discharge Elimination System (NPDES), for storm water discharge from Site.

C. Perform Work according to SCDOT standards within road right-of-way.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Furnish dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.

B. Provide monitoring wells and monitoring equipment to obtain meaningful observations of conditions affecting excavation, adjacent structures, and adjacent water wells.

C. Furnish standby equipment stored at Project Site and ready for immediate use upon failure of dewatering equipment.

2.2 PERFORMANCE AND DESIGN CRITERIA

A. Design:

1. Lower water table within areas of excavation to minimum 5 feet below bottom of excavation to permit Work to be completed on dry and stable subgrade.
2. Relieve hydrostatic pressures in confined water bearing strata below excavation to eliminate risk of uplift or other instability of excavation.
3. Prevent damage to adjacent properties, buildings, structures, utilities, and other facilities from construction operations.
4. Prevent loss of fines, quick condition, or softening of foundation subgrade.
5. Maintain stability of sides and bottoms of excavations and trenches.
6. Surface Water Control System: Collect and remove surface water and seepage entering excavation.

2.3 DEWATERING EQUIPMENT

A. Select dewatering equipment to meet specified performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Conduct additional borings and investigations to supplement subsurface investigations, as required to complete dewatering system design.

B. Utility Service Locator:

1. Call local utility service-line information at 811 not less than 3 working days before performing Work.
2. Request that underground utilities be located and marked within and immediately surrounding Site.

3.2 PREPARATION

A. Protect existing adjacent buildings, structures, and improvements from damage that may be caused by dewatering operations.

3.3 SURFACE WATER CONTROL SYSTEM

A. Provide ditches, berms, and other devices to divert and drain surface water from excavation area.

B. Divert surface water and seepage water within excavation areas into sumps and pump water into drainage channels, storm drains and/or settling basins in accordance with requirements of authorities having jurisdiction.

C. Control and remove unanticipated water seepage into excavation.

3.4 SYSTEM OPERATION AND MAINTENANCE

A. Operate dewatering system continuously until backfilling is complete.

B. Provide 24-hour supervision of dewatering system by personnel skilled in operation, maintenance, and replacement of system components.

C. If dewatering system cannot control water within excavation, notify Engineer and stop excavation work.

D. Modify dewatering and surface water control systems if operation causes or threatens to cause damage to new construction, existing Site improvements, adjacent property, or adjacent water wells.

E. Do not discontinue dewatering operations without approval of Engineer.

3.5 WATER DISPOSAL

A. Discharge water into storm sewer system, drainage channels and or settling basins.

3.6 SYSTEM REMOVAL

A. Remove dewatering and surface water control systems after dewatering operations are discontinued.

B. Remove piezometers and monitoring wells.

C. Fill abandoned wells with sand.

D. Abandoned Wells:

1. Cut off and cap abandoned wells minimum 36 inches below completed subgrade elevation.
2. Fill abandoned piping with grout.

E. Repair damage caused by dewatering and surface water control systems or resulting from failure of systems to protect property.

3.7 FIELD QUALITY CONTROL

A. Testing:

1. After dewatering system is installed, perform pumping test to determine at what point selected pumping rate lowers water level in well below pump intake.
2. Adjust pump speed, discharge volume, or both to ensure proper operation of each pump.

B. Monitoring and Recording:

1. Daily:

a. Note average discharge flow rate for each deep well, eductor header, well point, and ground water elevation.
b. Continue monitoring daily until steady state conditions occur, then monitor and record conditions twice each week.

2. Sand Content:

a. Monitor ground water discharge for sand content.
b. Sample and test water from each well bi-weekly for sand content.
c. Maximum Permitted Sand Content: 5 ppm.

3. Contaminates:

a. Monitor ground water discharge for contamination while performing pumping in vicinity of potentially contaminated sites.
b. Sample and test water bi-weekly for contaminates.

4. Existing Adjacent Buildings, Structures, and Improvements:

a. Survey bi-weekly during dewatering to detect movement in comparison to original elevations.
b. Notify Engineer immediately of measured movement.

END OF SECTION 312319

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SECTION 312323 - 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.

1.2 SUBMITTALS

A. Product Data: Geotextile fabric indicating fabric and construction.

B. Materials Source: Submit name of imported materials suppliers, if applicable.

C. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Perform Work according to SCDOT standards within road right-of-way.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Subsoil Fill: Satisfactory soils as specified in Section 310513 – Soils for Earthwork.

B. Structural Fill: Satisfactory soils as specified in Section 310513 – Soils for Earthwork.

C. Granular Fill: Aggregates as specified in Section 310516 – Aggregates for Earthwork.

D. Concrete:

1. Structural as specified in Section 033000 – Cast-In-Place Concrete with compressive strength of 4,000 psi.

2.2 ACCESSORIES

A. Geotextile Fabric: As specified in Section 310519.13 – Geotextiles for Earthwork.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subdrainage, dampproofing, and waterproofing installations have been inspected.

B. Verify that underground tanks are anchored to their own foundations to avoid flotation after backfilling.

C. Verify structural integrity of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to specified density requirements for subsequent backfill materials.

B. Soft Subgrade:

1. Cut out soft areas of subgrade not capable of compaction in place.
2. Backfill with structural fill and compact to density equal to or greater than specified requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 6 inches.

3.3 BACKFILLING

A. Backfill areas to contours and elevations.

B. Systematically backfill to allow maximum time for natural settlement.

C. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces, and do not backfill with frozen materials.

D. Maximum Compacted Depths:

1. Place material in continuous layers to following depths:

a. Subsoil Fill: 8 inches.
b. Structural Fill: 6 inches.
c. Granular Fill: 6 inches.

E. Use placement method that does not disturb or damage foundation perimeter drainage, utilities in trench, or other site features.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Structures:

1. Backfill against supported foundation walls.
2. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
3. Slope grade away from building minimum 2 percent slope for minimum distance of 10 feet.

H. Make gradual grade changes, and blend slope into level areas.

I. Remove surplus backfill materials from Site.

3.4 TOLERANCES

A. Top Surface of Backfilling within Building Areas: Plus or minus 1 inch from required elevations.

B. Top Surface of Backfilling under Paved Areas: Plus or minus 1 inch from required elevations.

C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Perform laboratory material tests according to ASTM D698.

B. In-Place Compaction Testing:

1. Density Tests: ASTM D1556/D1556M, ASTM D2167, and/or ASTM D6938, as applicable.
2. Moisture Tests: ASTM D6031/6031M.

C. If tests indicate that Work does not meet specified requirements, remove Work, replace, compact, and retest.

D. Testing Frequency: Once per lift of backfill.

E. Proof-roll compacted fill surfaces under slabs on grade and all paving areas. Refer to Section 3.7 of Rough Grading Specification (312213) for additional information.

3.6 PROTECTION

A. Reshape and recompact fills subjected to vehicular traffic during construction.

END OF SECTION 312323

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SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rock Energy Dissipator.
2. Paved Energy Dissipator.
3. Rock Barriers.
4. Sediment Traps.

1.2 SUBMITTALS

A. Product Data: Joint filler, Joint sealer, Admixtures, Curing compounds, Geotextile.

B. Proposed Mix Design: Furnish design of each class of concrete for review prior to commencement of Work.

C. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.

D. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Perform Work according to requirements of Section 310513 – Soils for Earthwork, Section 310516 – Aggregates for Earthwork, Section 312323 – Fill, Section 311000 – Site Clearing, Section 312316 – Excavation, Section 334200 – Stormwater Conveyance, Section 329119 – Landscape Grading, and Section 329219 – Seeding.

B. Perform Work according to SCDHEC standards.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not place grout when air temperature is below freezing.

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 ROCK AND GEOTEXTILE MATERIALS

A. Rock:

1. As specified in Section 310516 – Aggregates for Earthwork.

B. Geotextile Fabric:

1. As specified in Section 310519.13 – Geotextiles for Earthwork.

2.2 CONCRETE MATERIALS AND REINFORCEMENT

A. Cement:

1. Type 1, grey, as specified in Section 033000 – Cast-In-Place Concrete.

B. Fine and Coarse Aggregates:

1. As specified in Section 033000 – Cast-In-Place and Section 310516 – Aggregates for Earthwork.

C. Water: Clean and not detrimental to concrete.

D. Admixtures:

1. Air Entrainment: Comply with ASTM C260.
2. Chemical:

a. Type A, as specified in Section 033000 – Cast-In-Place Concrete.

3. Fly Ash or Calcined Pozzolan:

a. As specified in Section 033000 – Cast-In-Place Concrete.

4. Plasticizing:

a. As specified in Section 033000 – Cast-In-Place Concrete.

E. Aggregate, Sand, Water, Admixtures: Precast: Determined by precast fabricator, as appropriate to design requirements and PCI MNL-116S.

F. Reinforcement Steel:

1. Deformed bars, galvanized, as specified in Section 321313 – Concrete Paving.

G. Welded Steel Wire Fabric:

1. Deformed Type, flat sheets, unfinished, as specified in Section 321313 – Concrete Paving.

2.3 BLOCK, STONE, AGGREGATE, AND SOIL MATERIALS

A. Precast Solid Concrete Block:

1. Furnish according to SCDOT standards, and in accordance with Plans.

B. Stone:

1. Granite, Limestone.
2. Furnish according to SCDOT standards, and in accordance with Plans.

C. Coarse Aggregate:

1. As specified in Section 310516 – Aggregates for Earthwork.

D. Soil Backfill: As specified in Section 310513 – Soils for Earthwork. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

2.4 PLANTING MATERIALS

A. Seeding and Soil Supplements:

1. As specified in Section 329219 - Seeding.
2. Furnish according to SCDHEC standards.

B. Mulch:

1. As specified in Section 329219 - Seeding.
2. Furnish according to SCDHEC standards.

2.5 PIPE MATERIALS

A. Pipe:

1. Corrugated PE, as specified in Section 334200 – Stormwater Conveyance.
2. Concrete, as specified in Section 334200 – Stormwater Conveyance.
3. Plastic, as specified in Section 334200 – Stormwater Conveyance.

2.6 ACCESSORIES

A. Joint Sealers:

1. As specified in Section 033000 – Cast-In-Place Concrete.

B. Joint Filler:

1. As specified in Section 033000 – Cast-In-Place Concrete.

C. Grout:

1. As specified in Section 033000 – Cast-In-Place Concrete.

D. Steel Plate Anti-Vortex Device:

1. Furnish according to SCDHEC standards, and in accordance with Drawings.

E. Welding Material:

1. Furnish according to SCDHEC standards, and in accordance with Drawings.

F. Anti-Seep Collar:

1. Furnish according to SCDHEC standards, and in accordance with Drawings.

G. Trash Rack:

1. Furnish according to SCDHEC standards, and in accordance with Drawings.

2.7 MIXES

A. Concrete:

1. 3000 psi, as specified in Section 033000 – Cast-In-Place Concrete.
2. Furnish according to SCDHEC standards, and in accordance with Plans.

2.8 SOURCE QUALITY CONTROL (AND TESTS)

A. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.

B. Test samples according to ACI 301.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade, granular base, stabilized soil is acceptable and ready to support devices and imposed loads.

B. Verify gradients and elevations of base or foundation for other Work are correct.

3.2 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 four 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 three days after grouting, using water saturated burlap according to Section 033000 – Cast-In-Place Concrete.

E. Install Work according to SCDHEC standards.

3.3 PAVED ENERGY DISSIPATOR

A. Excavate to required paving depth. Remove loose, unsuitable material below bottom of paving, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

B. Place forms and reinforcement according to Section 321313 – Concrete Paving. Hold reinforcement firmly in position during placing of concrete.

C. Mix, place, finish, and cure concrete, as specified in Section 321313 Concrete Paving.

D. Embed stones or blocks 3 inches in plastic concrete at indicated separation on slopes and channel bottom.

E. Pave in uniform 10 foot lengths or sections.

F. Pave in shorter sections as necessary for closures or curves.

G. Place premolded expansion joint filler, 1/2 inch thick, cut to conform to paving cross sections, at ends of curved sections at intervals of not more than 100 feet, at end of day's work, and where paving is adjacent to rigid structure. Use joint filler with depth of 1/2 inch less than paving depth and press firmly against adjacent concrete.

H. Form intermediate joints between sections, with two thicknesses of bituminous paper cut neatly to paving cross section.

I. Seal joint top with joint sealer.

J. Install Work according to SCDOT standards.

3.4 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 indicated shape, height and slope.

C. Construct coarse aggregate filter blanket against upstream face of rock barrier to indicated thickness.

D. Install Work according to SCDHEC standards.

3.5 SEDIMENT TRAPS

A. Clear Site, as specified in Section 311000 – Site Clearing.

B. Construct trap by excavating and forming embankments as specified in Section 312316 – Excavation, and Section 312323 – Fill.

C. Place coarse aggregate or rock at outlet as indicated on Drawings.

D. Place geotextile fabric, as specified for rock energy dissipator.

E. When required, obtain borrow excavation for formation of embankment, as specified in Section 312316 – Excavation.

F. On entire sediment trap area, apply soil supplements and sow seed as specified in Section 329219 – Seeding.

G. Mulch seeded areas with hay as specified in Section 329219 – Seeding.

H. Install Work according to SCDHEC standards.

3.6 SITE STABILIZATION

A. Incorporate indicated erosion control devices into Project at 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 10 feet. Slope stockpile sides at 4:1 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 14 days.

1. During non-germinating periods, apply mulch at recommended rates.
2. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year according to Section 329219 permanent seeding specifications.

E. Stabilize sediment traps, and stockpiles immediately.

3.7 FIELD QUALITY CONTROL

A. 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.

B. Field test concrete according to Section 033000 – Cast-In-Place Concrete.

C. Compaction Testing: As specified in Section 312323 – Fill.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Compaction Testing: One for each lift.

3.8 CLEANING

A. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

B. Do not damage structure or device during cleaning operations.

C. Do not permit sediment to erode into construction or Site areas or natural waterways.

D. Clean channels when depth of sediment reaches approximately one-half channel depth.

3.9 PROTECTION

A. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit construction traffic over paving for seven days minimum after finishing.

C. Protect paving from elements, flowing water, or other disturbance until curing is completed.

END OF SECTION 312500

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete paving for:

a. Concrete sidewalks.
b. Concrete stair steps and ramps

1.2 SUBMITTALS

A. Product Data:

1. Submit data on concrete materials, joint filler, admixtures, curing compounds.

B. Design Data:

1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Perform Work in accordance with SCDOT standards, within road right-of-way.

PART 2 - PRODUCTS

2.1 CONCRETE PAVING

A. Form Materials:

1. Wood or Steel form material, profiled to suit conditions.
2. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, ½ inch thick.

B. Reinforcement:

1. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish. Use galvanized finish only where shown on plans.
2. Welded Plain Wire Fabric: ASTM A185/A185M; in flat sheets; unfinished.

3. Dowels: ASTM A615/A615M; 60 ksi yield strength, plain steel bars; cut to length indicated on Drawings, square ends with burrs removed; unfinished.
4. Tie Wire: Minimum 16 gage annealed type.

C. Concrete Materials:

1. Cement: ASTM C150, Type I – Normal Portland type; gray color.
2. Fine and Coarse Aggregates: ASTM C33, Class 4M.

   a. Maximum Size: ¾ inch.

3. Water: ASTM C94/C94M; potable.
4. Air Entrainment: ASTM C260.
5. Chemical Admixture: ASTM C494/C494M.

   a. Type A - Water Reducing.

6. Fly Ash: ASTM C618 Class F or C.

7. Slag: ASTM C989; Grade 100; ground granulated blast furnace slag.

8. Plasticizing: ASTM C1017/C1017M Type I, plasticizing, Type II, plasticizing and retarding.

2.2 FABRICATION

A. Fabricate reinforcing in accordance with CRSI Manual of Practice and SCDOT standards.

2.3 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94 Option A.

B. Furnish concrete with the following characteristics:

1. Compressive Strength at 28 days: 3,000 psi or as noted on plans.
2. Maximum water/cement ratio: 0.45.
3. Slump: 3 inches maximum.
4. Air Entrainment: ASTM C94/C94M; for moderate exposure condition; maximum variation of 1.5 percent from required air content.
5. Limit the following cementitious materials to maximum percentage by mass of all cementitious materials:

   a. Fly Ash and Blast Furnace Slag: 50 percent.

C. Use accelerating admixtures in cold weather only when approved by the Engineer in writing. Use of admixtures will not relax cold weather placement requirements.

D. Use set retarding admixtures during hot weather only when approved by the Engineer in writing.

2.4 FINISHES

A. Shop Finishing - Reinforcement:

1. Galvanized Finish for Steel Bars: ASTM A767/A767M, Class II, hot dip galvanized after fabrication.

2.5 ACCESSORIES

A. Curing Compound: ASTM C1315 Type and Class are as follows:

1. Type I – Clear or translucent.
2. Class A – Non-yellowing.

B. Membrane Curing and Sealing Compound: ASTM C1315 Type I, Class A.

C. Surface Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

D. Joint Sealant: ASTM D6690, Type I; hot applied type.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify gradients and elevations of base.

B. Verify compacted subgrade, granular base or stabilized soil is ready to support paving and imposed loads.

3.2 PREPARATION

A. Moisten substrate to minimize absorption of water from fresh concrete.

3.3 INSTALLATION

A. Forms:

1. Place and secure forms to correct location, dimension, and profile.
2. Place joint filler in joints, vertical in position, in straight lines. Secure to formwork.
3. Place expansion and contraction joints as indicated on drawings. Align joints.
4. Place joint filler between paving components and other appurtenances.

B. Reinforcement:

1. Place reinforcing as indicated on drawings.

2. Interrupt reinforcing at expansion joints. Lubricate one-half of dowel to prevent bond to concrete on one side of joint.
3. Place dowels and reinforcing to achieve paving and curb alignment as detailed.
4. Provide doweled joints at 15 inch spacing at transverse joints or interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.

C. Placing Concrete:

1. Place concrete in accordance with ACI 301.
2. Do not disturb reinforcing or formwork components during concrete placement.
3. Place concrete continuously between predetermined joints.

D. Finishing:

1. Area Parking, Road, Loading Dock Aprons, Refuse Dumpster Pad Paving: Wood float.
2. Sidewalk and all other Concrete Surfaces: Wood float unless directed otherwise by Owner or in drawings.
3. Apply curing compound on exposed concrete surfaces immediately after finishing.

3.4 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation from True Position: 1/4 inch.

3.5 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with ASTM C94/C94M, ACI 301 and SCDOT standards.

B. Inspect reinforcing placement for size, spacing, location, support.

C. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

D. Strength Test Samples:

1. Sample concrete and make one set of three cylinders for every 75 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area paving.
2. Make one additional cylinder during cold weather concreting, and field cure.

E. Field Testing:

1. Slump Test Method: ASTM C143/C143M.

2. Air Content Test Method: ASTM C173/C173M and ASTM C231.
3. Temperature Test Method: ASTM C1064/C1064M.

F. Cylinder Compressive Strength Testing:

1. Test Method: ASTM C39/C39M.
2. Test one cylinder at 7 days.
3. Test two cylinders at 28 days.

END OF SECTION 321313

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SECTION 321623 - SIDEWALKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Concrete paving for sidewalks.

1.2 SUBMITTALS

A. Product Data:

1. Information regarding concrete materials**,** joint filler, admixtures, and curing compounds.
2. Mix Design:

    a. Concrete mix design for each concrete strength prior to commencement of Work.
    b. 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.

B. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Perform Work according to ACI301.

B. Obtain cementitious materials from same source throughout.

C. Manufacturer Qualifications: Manufacturer of ready-mixed concrete projects complying with ASTM C 94 requirements for production facilities and equipment.

D. Installer Qualifications: An experienced installer who has completed pavement work 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.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials according to manufacturer instructions.

B. 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.

1.5 AMBIENT CONDITIONS

A. Minimum Conditions: Do not place concrete if base surface temperature is less than 40 deg. F, or if surface is wet or frozen.

B. 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.

1.6 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 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: 1/2 inch.

B. Reinforcement:

1. Deformed Reinforcing:

a. Steel: Comply with ASTM A615/A615M.
b. Yield Grade: 60 ksi.
c. Billet Bars: Deformed.
d. Finish: Uncoated. Use galvanized finish only where shown on plans.

2. Deformed Bar Mats:

a. Description: Steel bars.
b. Comply with ASTM A184/A184M.
c. Fabrication: Comply with ASTM A706/A706M.
d. Yield Strength: 60 ksi.
e. Finish: Uncoated.

3. Welded Plain-Wire Fabric:

a. Comply with ASTM A1064/A1064M.
b. Configuration: Flat sheets.
c. Finish: Uncoated.

4. Dowels:

a. Description: Plain steel bars.
b. Comply with ASTM A615/A615M.
c. Yield Strength: 60 ksi.
d. Length: As indicated.
e. Ends: Square, with burrs removed.
f. Finish: Uncoated.

5. Tie Wire:

a. Type: Annealed.
b. Minimum Size: 16 gage.
c. Finish: Uncoated.

6. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

C. Concrete:

1. Cement:

a. Comply with ASTM C150/C150M.
b. Type: I portland.
c. Color: Gray.

2. Fine and Coarse Aggregates:

a. Comply with ASTM C33/C33M.
b. Class: 4M.
c. Coarse Aggregate Maximum Size: 3/4 inch.

3. Water:

a. Description: Potable.
b. Comply with ASTM C94/C94M.

4. Air Entrainment: Comply with ASTM C260/C260M.

5. Chemical Admixtures:

a. Comply with ASTM C494/C494M.
b. Type: A.

6. Fly Ash:

a. Comply with ASTM C618.
b. Class: F or C.

7. Slag:

a. Description: Ground-granulated blast-furnace slag.
b. Comply with ASTM C989/C989M.
c. Grade: 100 or 120.

8. Plasticizing:

a. Comply with ASTM C1017/C1017M.
b. Type: I or II.

2.2 FABRICATION

A. Reinforcing:

1. Comply with CRSI Manual of Practice.

B. Hooks:

1. As indicated.
2. Type:

a. Standard 90-degree bends.
b. Seismic.

2.3 MIXES

A. Concrete:

1. Comply with ASTM C94/C94M, Option A.

2. Mix Design:

a. Compressive Strength: 3000 PSI at 28 days, or as noted on plans.
b. Slump: 3 inch maximum.
c. Maximum Water/Cement Ratio: 0.45.
d. Air Entrainment:

1) Comply with ASTM C94/C94M.
2) Exposure Condition: Moderate.
3) Maximum Variation from Required Air Content: 1.5 percent.

3. Limit following cementitious materials to maximum percentage by weight of combined cementitious materials:

    a. Fly Ash and Blast-Furnace Slag: 50 percent.

4. Admixtures:

    a. Use accelerating admixtures in cold weather only if approved by Engineer in writing.
    b. Use of admixtures will not relax cold-weather placement requirements.
    c. Use calcium chloride only if approved by Engineer in writing.
    d. Use set-retarding admixtures during hot weather only if approved by Engineer in writing.

2.4 ACCESSORIES

A. Curing Compound:

1. Comply with ASTM C1315.
2. Type: I.
3. Class: A.

B. Surface Retarder:

1. Waterborne monomolecular film forming, manufactured for application to fresh concrete.

C. Joint Sealers:

1. Hot Applied:

    a. Comply with ASTM D6690.
    b. Type: I.

2.5 SOURCE QUALITY CONTROL

A. Testing: Comply with ASTM C94/C94M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify that gradients and elevations of subgrade are as indicated.

C. Verify reinforcing placement for proper size, spacing, location, and support.

3.2 PREPARATION

A. Moisten substrate to minimize absorption of water from fresh concrete.

B. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 INSTALLATION

A. Forms:

1. Clean forms and coat with form oil each time before concrete is placed.
2. Wood Forms: Thoroughly wet with water before concrete is placed.

B. Reinforcement:

1. Place reinforcing as indicated on drawings.
2. Interrupt reinforcing at expansion joints.
3. Place dowels reinforcing to achieve indicated paving alignment as detailed.
4. Provide doweled joints at 15-inch spacing at transverse joints or interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.

C. Placing Concrete:

1. According to ACI 301.
2. Place concrete in forms in one layer.
3. Place concrete continuously over full width of panel and between predetermined construction joints.
4. Do not break or interrupt successive pours such that cold joints occur.
5. Place concrete to pattern as indicated.

D. Joints:

1. Place continuous transverse expansion and contraction joints as indicated on drawings.
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 joints at 3-foot intervals between sidewalks and curbs.
4. Saw-cut contraction joints 1/4 inch wide at optimum time after finishing, cutting one-third into depth of slab.
5. Seal joints as indicated on drawings.

E. Finishing:

1. Wood float unless directed otherwise by Owner or in drawings.
2. Ramps and stair steps: Broom perpendicular to slope.

3. Place curing compound on exposed concrete surfaces immediately after finishing.
4. Edges and Joints:

    a. Edger Radius: 1/4 inch.
    b. Spalled Corners and Edges: Clean and fill with mortar mixture and finish.

F. 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.

G. Backfilling: After curing, backfill, grade, and compact adjacent disturbed area as indicated.

3.4 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.

B. Maximum Variation from True Position: 1/4 inch.

C. Line and Grade for Forms: 1/8 inch in any 10-foot-long section.

3.5 FIELD QUALITY CONTROL

A. 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 three cylinders for every 75 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 at seven days, and two cylinders at 28 days.
    d. 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 and C231/C231M.
    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. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, rain and flowing water, and mechanical injury.

B. Do not permit traffic over paving for minimum 14 days after finishing.

C. 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 321623

SECTION 323113 - 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.

1.2 SYSTEM DESCRIPTION

A. Fence Height: As indicated on drawings.

B. Line Post Spacing: At intervals not exceeding 8 feet.

C. Fence Post and Rail Strength: Conform to ASTM F1043 Heavy Industrial Fence quality.

1.3 SUBMITTALS

A. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

B. Product Data: Fabric, posts, accessories, fittings and hardware.

1.4 QUALITY ASSURANCE

A. Supply material according to CLFMI - Product Manual.

B. Perform installation according to ASTM F567.

C. Manufacturer: Company specializing in manufacturing products specified in this Section with three (3) years' experience.

D. Installer: Company specializing in performing work of this Section with three (3) years' experience and approved by manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.

B. Fabric Wire (Steel): ASTM F668 PVC coated steel wire.

C. Barbed Wire: PVC-coated steel strands with galvanized steel barbs; 12 gage thick wire, 2 strands, 4 points at [3] inch o.c.

D. Concrete: Normal Sulfate-resisting portland cement, 3,000 psi strength at 28 days complying with ASTM C94.

2.2 COMPONENTS

A. Line Posts: 2.5 inch diameter.

B. Corner and Terminal Posts: 3.5 inch.

C. Gate Posts: 3.5 inch diameter.

D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

E. Gate Frame: 2 inch diameter for end post at hinges and 1.66 inch diameter for remainder of gate frame, fittings and truss rod fabrication.

F. Fabric: 1.75 inch diamond mesh interwoven wire, 9 gage thick, top salvage knuckle end closed, twisted tight, bottom selvage knuckle end closed.

G. Tension Wire: 7 gage thick steel, single strand, marcelled, spiraled or crimped, aluminum-coated tension wire conforming to ASTM A824.

H. Tension Band: 0.105 inch thick steel (12 gage).

I. Tension Strap: 0.105 inch thick steel (12 gage).

J. Tie Wire: Aluminum alloy steel wire.

2.3 ACCESSORIES

A. Caps: Galvanized pressed steel or 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. Extension Arms: Galvanized pressed steel, to accommodate three strands of barbed wire, single arm, sloped to 45 degrees.

D. Gate Hardware: Center gate stop and drop rod and Mechanical keepers; 180 degree gate hinges for each leaf and hardware for padlock accessible from both sides of gate.

2.4 GATES

A. General:

1. Gate Types, Opening Widths and Directions of Operation: As indicated.
2. Factory assemble gates.
3. Conform to requirements specified for PVC-coated steel chain link fence except that PVC-coated aluminum alloy framing conforming to ASTM B429/B429M may be used.
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.

C. Sliding Gates:

1. Framing and Posts: ASTM F1184, Class 2 for internal rollers.
2. Rollers for overhead and cantilever sliding gates: Bearing type. Furnish non-sealed bearings with grease fitting for periodic maintenance.
3. Secure rollers to post or frame without welding.

D. Cantilever Sliding Gates:

1. Fabricate gate leaf frames and tracks of aluminum conforming to ASTM B429/B429M alloy 6063-T6 or as required to meet performance requirements of ASTM F1184.
2. Frame Members: Minimum 2 inches 0.91 lb. per ft aluminum tubing welded assembly forming rigid, one-piece unit.
3. Install fabric securely stretched and held in center of tubing.
4. Brace cantilever overhang frames with 3/8 inch brace rods. For gate leaf sizes greater than 23 feet, fabricate with additional lateral support rail welded adjacent to top and bottom horizontal rails.
5. Provide minimum overhang for each leaf opening size as follows:

    a. Up to 10'-0": 6'-6"
    b. 10'-0" to 14'-0": 7'-6"
    c. 14'-1" to 22'-0": 10'-0"
    d. 22'-1"to 30'-0": 12'-0"

6. Track: Combined, integral track and rail.
7. Rail: Aluminum extrusion; minimum total weight of 3.72 lb. per ft; designed to withstand reaction load of 2,000 lb.

8. Roller Track Assembly: Two swivel type, zinc, die cast trucks having four, sealed lubricant ball bearing wheels minimum 2 inches diameter by 9/16 inches width designed for same reaction load as rail. Provide two side-rolling wheels for each gate leaf to maintain alignment of truck in track.
9. Fasten trucks to post brackets by minimum 7/8 inch diameter, 1/2 inch shank ball bolts.
10. Provide galvanized steel guide wheel assemblies consisting of two rubber wheels of minimum 4 inch diameter with oil-impregnated bearings for each supporting post.
11. Attach guide wheel assembly to post so bottom horizontal member rolls between wheels and permitting adjustment to maintain plumb gate frames and proper alignment.

2.5 FINISHES

A. Components and Fabric: Vinyl coating, black color according to ASTM F934 as selected.

B. Vinyl Components: Black color to match fabric as selected.

C. Hardware: Galvanized to ASTM A153/A153M, 1.8 oz per sq ft coating. Black vinyl coating.

D. Accessories: Same finish as framing and fabric.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates according to ASTM F567.

B. Set end, corner, intermediate line, and gate posts plumb, in concrete footings with top of footing 6 inches below finish grade. Slope top of concrete for water runoff.

C. Line Post Footing Depth Below Finish Grade: 3 feet.

D. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: 3 feet.

E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

F. Install top rail through line post tops and splice with 6 inch long rail sleeves.

G. Install center and bottom brace rail on corner gate leaves.

H. Place fabric on outside of posts and rails.

I. Do not stretch fabric until concrete foundation has cured 7 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 1 inch above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install support arms sloped outward and attach barbed wire; tension and secure.

P. Support gates from gate posts. Do not attach hinged side of gate from building wall.

Q. Install gate with fabric and barbed wire overhang, if applicable, to match fence. Install three hinges on each gate leaf, latch, catches, retainer and locking clamp.

R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

S. Connect to existing fence at new terminal post.

T. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.

U. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.

V. 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.

W. Extend concrete footings 1 inch above grade, and trowel, forming crown to shed water.

X. Allow footings to cure minimum seven days before installing fabric and other materials attached to posts.

3.2 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch.

B. Maximum Offset from Indicated Position: 1 inch.

C. Minimum distance from property line: 6 inches.

END OF SECTION 323113

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SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparation of subsoil.
2. Soil testing.
3. Placing topsoil.

1.2 SUBMITTALS

A. Minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

B. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Perform Work according to SCDOT, SCDHEC, and local municipality standards.

1.4 COORDINATION

A. Coordinate with installation of underground sprinkler system piping and watering heads.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Topsoil: As specified in Section 310513 – Soils for Earthwork.

B. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained Site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

2.2 ACCESSORIES

A. Edging: As specified in plans.

2.3 SOURCE QUALITY CONTROL

A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, limestone, soluble salt content, organic matter content, and pH value.

B. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

C. Testing 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. Verify prepared soil base is ready to receive 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 4 to 6 inches as specified in plan 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 329113

SECTION 329119 - LANDSCAPE GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Final grade topsoil for finish landscaping.

1.2 SUBMITTALS

A. Samples: In air-tight containers, 10 lb. sample of each type of fill to testing laboratory.

B. Materials Source: Furnish 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 Work.

B. Perform Work according to SCDOT, SCDHEC, and local municipality standards.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Topsoil: As specified in Section 310513 – Soils for Earthwork**.**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify building and trench backfilling have been inspected.

B. 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, in excess of 1/2 inch in size. 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, sodding, and planting is indicated and to thickness as scheduled. Place topsoil during dry weather.

B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.

C. Remove roots, weeds, rocks, and foreign material while spreading.

D. Manually spread topsoil close to plant material, building, walkway, pavement, and curbs to prevent damage.

E. Lightly compact and roll placed topsoil.

F. Remove surplus subsoil and topsoil from Site.

G. Leave stockpile area and Site clean and raked, ready to receive landscaping.

3.5 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch.

3.6 PROTECTION OF INSTALLED WORK

A. Prohibit construction traffic over topsoil.

3.7 SCHEDULES

A. Compacted topsoil thicknesses:

1. Seeded Grass: 6 inches.
2. Sod: 4 inches.
3. Shrub Beds: 18 inches.
4. Flower Beds: 12 inches.
5. Planter Boxes: To within 3 inches of box rim.

END OF SECTION 329119

SECTION 329219 - SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fertilizing.
2. Seeding.
3. Hydroseeding.
4. Mulching.
5. Maintenance.

1.2 DEFINITIONS

A. Weeds: Include dandelion, jimsonweed, quack grass, horsetail, morning glory, rush grass, mustard, lamb's quarters, chickweed, cress, crabgrass, Canadian thistle, nut grass, poison oak, blackberry, tansy ragwort, Bermuda grass, Johnson grass, poison ivy, nut sedge, nimble will, bindweed, bent grass, wild garlic, perennial sorrel, and brome grass.

1.3 SUBMITTALS

A. Product Data: Seed mix, fertilizer, mulch, and other accessories.

B. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.5 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 SCDOT, SCDHEC, and local municipality standards.

C. Seed Supplier: Company specializing in manufacturing products specified in this Section with three years' experience.

D. Installer: Company specializing in performing Work of this Section and with a record of successful grass establishment.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.7 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition, but not less than 60 days after the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SEED MIXTURE

A. Grass Seed: Fresh, clean, dry, Blue-Tag certified seed complying with the Official Crop Certifying Agency of South Carolina.

B. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Schedules in Plans.

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 soil analysis from a qualified soil-testing agency. If soil testing is not conducted, provide soil amendments within the parameters documented in Section 3.7.

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: As specified in Plans.

F. Herbicide: EPA registered and approved, of type recommended by manufacturer.

G. Stakes: Softwood lumber, chisel pointed.

H. String: Inorganic fiber.

2.3 SOURCE QUALITY CONTROL

A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

B. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

C. 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. Verify prepared soil base is ready to receive 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 in the planting schedule, evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: As recommended by manufacturer.

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 lb./linear ft.

F. Immediately following seeding and compacting, apply mulch to thickness of 1/8 inch. 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 35 lb. per 1,000 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 2 to 4 inches.

3.5 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 6 inches. Space stakes at 60 inches.

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.

3.7 PLANTING SOIL AMENDMENTS SCHEDULE

A. Lawns: Provide soil amendments required to provide planting medium within the following parameters:
   1. Soil pH range: 5.8 – 6.2.
   2. Phosphorus index of 50; equivalent to 60 ppm P (137 ppm P205).
   3. Potassium index of 50; equivalent to 100 ppm K (120 ppm K20).
   4. Calcium equivalent to 40 – 60 percent of Cation Exchange Capacity (CEC) (Ca%=(Ca/CEC)).
   5. Magnesium equivalent to 8 – 15 percent of CEC (Mg%=(Mg/CEC)).
   6. Base Sat equivalent to 60 – 80 percent of CEC (BS%=((Ca = Mg = K)/CEC).
   7. Manganese Index Mn-I 25 equivalent to 4.0 ppm.
   8. Zinc Index Zn-I 25 equivalent to 1.0 ppm Zn.
   9. Copper Index Cu-I 25 equivalent to 0.5 ppm Cu.

END OF SECTION 329219

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SECTION 331100 - WATER DISTRIBUTION SYSTEMS

NOTE: CONTRACTOR SHALL COMPLY WITH THE STANDARD WATER SPECIFICATIONS FOR THE LOCAL MUNICIPALITY. CONTRACTOR TO ONLY USE THIS SECTION OF SPECIFICATIONS TO ADDRESS THOSE ITEMS NOT COVERED IN THE LOCAL MUNICIPALITY SPECIFICATIONS.

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and fittings.

B. Valves.

C. Hydrants.

D. Underground pipe markers.

E. Precast concrete vault.

F. Bedding and cover materials.

1.2 RELATED SECTIONS

A. Section 033000 – Cast-In-Place Concrete

Section 312316.13 – Trenching

1.3 SUBMITTALS

A. Product Data: Submit technical data and installation instructions on pipe materials, pipe fittings, valves and accessories.

B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

C. Hydrostatic Testing:
1. Submit Schedule of hydrostatic testing seven days prior to testing.
2. Submit proposed method of disposal of wastewater from hydrostatic testing and disinfection water.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Qualifications: At least 3 years of successful installation experience on projects with potable water piping work similar to that required for project.

B. Codes and Standards
   1. Plumbing Code Compliance
      a. Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of potable water system materials and products.
   2. Water Purveyor Compliance
      a. Comply with requirements of Purveyor supplying water to project. Obtain required permits and inspection.
   3. SCDHEC Compliance
      a. Comply with State Primary Drinking Water Regulations.

C. All material or products which come into contact with drinking water shall be third party certified as meeting the specifications of the American National Institute/National Sanitation Foundation Standard 61, Drinking Water System Components - Health Effects. The American National Standards Institute shall accredit the certifying party.

D. Steel pipe and asbestos cement pipe shall not be used in potable water systems.

E. Natural rubber or other material which will support microbiological growth may not be used for any gaskets, O-rings, and other products used for jointing pipes, setting meters or valves, or other appurtenances which will expose the material to the water.

F. Lubricants that will support microbiological growth shall not be used for slip-on joints. The use of vegetable shortening is prohibited.

G. The use of solvent-weld PVC pipe and fittings in water mains 4-inch and larger is prohibited.

H. Any pipe, solder, or flux which is used in the installation or repair of any public water system, used in any plumbing, which provides water through connection to a public water system, for human consumption, shall be lead free. Lead free, for solder and flux, means those containing not more than 0.2% lead. Lead free, for pipes and pipe fittings, means those containing not more than 8.0% lead. Leaded joints necessary for the repair of CIP shall be exempt from the above.

I. No flushing device shall be directly connected to any sewer.

J. Chambers, pits or manholes containing valves, blow-offs, meters, air relief valves, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer.

K. All pipe, fittings, packing, jointing materials, valves and fire hydrants shall conform to Section C of the AWWA Standards.

L. Water mains which have been previously used for conveying potable water may be reused provided they meet applicable criteria from AWWA Section C, ANSI/NSF 61, and ASTM D 1785 or D 2241. The mains must be thoroughly cleaned and restored practically to their original condition.

M. All water mains shall be provided with a minimum of 30 inches of cover, unless pipe material is ductile from, or other approved materials, and if exposed should be insulated to prevent freezing.

N. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

B. Equipment and spare parts must be properly protected against any damage during a prolonged period at the site.

C. Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built and securely bolted.

D. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

E. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

F. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.7 MEASUREMENT AND PAYMENT

A. No separate measurement and payment will be made for Water Utility Distribution Piping. Payment will be made in accordance with the lump sum price to which it pertains as listed on the Bid Form.

PART 2 PRODUCTS

2.1 WATER PIPING

A. Polyethylene Tubing: Pipe smaller than 2 inches shall be polyethylene tubing, SDR 7.3, and shall conform to ASTM D2737.
   1. Fittings: AWWA C901, molded.
   2. Joints: Butt fusion.

B. Ductile Iron Pipe (DIP): (Pipe 3 inches through 48 inches)
   1. Pressure Class 350. Designed in accordance with AWWA C150 and C151.
   2. Fittings: Ductile iron, 350 psi working pressure and equal thickness as joining pipe.
   3. Joints: AWWA C111, rubber gasket.
   4. Linings: Cement lining per AWWA C104.
   5. Coatings: Asphaltic coating, as per AWWA C151, approximately 1 mil thick.

C. Polyvinyl Chloride (PVC) Pipe:
   1. Pipe less than 4 inches, conform to ASTM D1785, Schedule 80:
      a. Fittings: ASTM D2466, PVC.
      b. Joints: ASTM D2855, solvent weld.
   2. Pipe 2 inches through 4 inches, conform to AST M D2241
      a. SDR 21 with minimum pressure rating of 200 psi at 73.4 degrees F
      b. Hydrostatically test as AWWA C900
      c. Joints shall be integral bell type and shall conform to ASTM D3139
   3. Pipe 4 inches through 12 inches, conform to AWWA C900 Class 200:
      a. Fittings: AWWA C111, cast iron.
      b. Joints: ASTM D3139 compression gasket ring.
   4. Pipe 12 inches through 48 inches, conform to AWWA C905 Class 200:
      a. Fittings: AWWA C111, cast iron.
      b. Joints: ASTM D3139 compression gasket ring.
   5. Conform to cast iron outside diameter (CIOD) size dimensions.
   6. Conform to National Sanitation Foundation (NSF) Standard 14 and be marked “NSF Approved” on the pipe.

D. Steel Piping: All steel waterline pipe shall conform to the requirements of AWWA C200 or ASTM A53 or A120.

E. High Density Polyethylene (HDPE) Pipe: HDPE waterline pipe, 4 inches through 63 inches, shall conform to the requirements of AWWA C906.

F. Joints connecting pipe of differing materials shall be made in accordance with manufacturer’s recommendation.

G. All pipe material, solder and flux shall be lead free (less than 0.2 percent lead in solder and flux and less than 8.0 percent lead in pipes and fittings).

H. Thermoplastic pipe shall not be used above grade.

2.2 FITTINGS

A. Ductile Iron (3 Inch – 48 Inches): ANSI/AWWA C 110/A 21.10. Note: Compact Ductile Iron Fittings (ANSI/AWWA C 153/A 21.53) may be substituted only in conditions with space limitations and with the concurrence of the Owner’s Representative.

B. Joints: Match pipe furnished.

C. Coating and Lining:
   1. Outside Coating: Bituminous enamel, minimum thickness 1 mil.
   2. Inside Lining: Cement mortar; ANSI/AWWA C 104/A 21.4.

2.3 FLEXIBLE EXPANSION JOINTS

A. Single ball flexible expansion joint designed for protection against bending moments.

B. Construction:
   1. Manufactured of 65-45-12 ductile iron conforming to the material requirements of ASTM A 536 and ANSI/AWWA C 153/A 21.53.
   2. Working Pressure: 350 psi for flexible joints 3 inch through 24 inch in size; 250 psi for flexible joints 30 inch and over in size.
   3. Expansion joint designed and cast as an integral part of a ball and socket type flexible joint; 4 inch minimum expansion capability.
   4. Each ball and socket capable of at least 15 degrees deflection.
   5. Coating and Lining:
      a. Outside Coating: Coat tar epoxy, minimum thickness 5 mils.
      b. Inside Lining and Seal Contact Surfaces: NSF approved fusion-bonded epoxy conforming to the material requirements of and tested in accordance with ANSI/AWWA C 213.
   6. Joints (Mechanical Joint or Flanged Ends): Match joints of pipe furnished.
   7. Pressure tested against its own restraint at rated working pressure.

C. Acceptable Manufacturer: EBAA Iron Sales, Inc., P.O. Box 857, Eastland, TX 76448.

2.4 GATE VALVES

A. 2-1/2 inches and Smaller: Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, extension box.

B. 3 inches and Larger: AWWA C509, Iron body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, control rod, post indicator, extension box and valve key.

C. Gate valves shall be designed for a minimum working pressure of 250 psi (unless otherwise noted on plans).

D. Connections shall be as required for piping

E. Valves shall opened by turning counterclockwise and have a clear waterway equal to the full nominal diameter of the valve.

F. Operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

G. All gate valves shall be Underwriters Laboratories listed and Factory Mutual approved.

H. Provide one T-handle operator for each ten buried valves with nut operator.

2.5 COUPLINGS

A. Mechanical Couplings:

1. Sleeve type providing a tight flexible joint under conditions, such as pipe movements caused by expansion, contraction, slight settling of or shifting in the ground, minor variations in trench gradients, and traffic violations.
2. Couplings shall be of strength not less than the adjoining pipeline.
3. Sleeve type couplings shall consist of one steel middle ring, two steel followers, two gaskets, and the necessary steel bolts and nuts to compress the gaskets.
4. As manufactured by Dresser Manufacturing, Bradford, PA Style 138.

2.6 UNDERGROUND PIPE MARKERS

A. All water mains shall be detectable within 3 feet with electronic locating equipment.

B. Iron Pipe: Bright colored plastic ribbon type, continuously printed, minimum 4 inches wide by 4 mil thick, manufactured for direct burial service. Shall be buried at a depth of 1-1/2 feet from finished grade.

C. Plastic Pipe: Continuous 12-gauge, blue insulated, copper tracer wire. Shall be buried a minimum of 6” above top of water main.

2.7 PRECAST CONCRETE VAULT

A. Precast vault designed in accordance with ASTM C858, comprising modular, interlocking sections complete with accessories.

B. Manufactured by Tindall or approved equal.

2.8 SERVICE CLAMPS

A. Furnish with a pressure rating not less than that of the pipe.

B. Double flattened strap type.

C. Clamps shall have a galvanized malleable iron body with cadmium plated straps and nuts

D. Clamps shall have rubber gasket cemented to the body.

E. Furnish Smith-Bleir 313 or approved equal.

2.9 CORPORATION STOPS

A. Conform to AWWA C800 with copper alloy body and tapered threads

2.10 SERVICE STOPS

A. Service stops shall be waterworks inverted ground key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of service

pipe used. All parts shall be bronze with female iron pipe size connections or hydrostatic test pressure not less than 200 psi.

2.11 GOOSENECKS

A. Use Polyethylene piping at higher pressure rating than connecting pipe. Length of cable and connections shall be in accordance with standard practice.

2.12 TAPPING SLEEVE AND VALVE

A. Tapping Sleeves:
   1. The ductile iron split sleeve type with flanged or grooved outlet, and with bolts, follower rings and gaskets on each end of the sleeve.
   2. Construction shall be suitable for a maximum working pressure of 200 psi.
   3. Bolts shall have square heads and hexagonal nuts.

B. Tapping Valves
   1. Material shall be compatible with tapping sleeve and shall conform to the requirements for gate valves above.
   2. Joints shall be flanged for the tapping sleeve and mechanical joint for the pipe end.

2.13 METER BOXES

A. Meter boxes shall be installed around valves with additional sections stacked above as required to bring the cover to existing grade level. All boxes shall be jumbo size meter boxes with heavy-duty lids as approved by the engineer.

B. The bottom box section shall be set on a firm bed of pea rock, which shall extend down at least 6-inches below the pipe.

C. Meter boxes shall be Carson-Brooks Model 1419-12 or equal. Cover shall be Carson-Brooks Model 1419-T or equal. Coat cover with two (2) shop coats bitumastic paint.

2.14 AIR RELIEF VALVES

A. Air Relief Valves shall be Crispin model number PL10 with ¼ inch orifice, or approved equal.

B. Provide heavy duty cast iron meter box to house valve.

2.15 FIRE HYDRANTS & POST HYDRANTS

A. General: Fire hydrants shall be provided as shown on the plans and as specified herein. Fire hydrants shall only be installed on 6” and larger pipelines capable of supporting fire flows of 500 GPM in addition to 1/5 maximum instantaneous demand. All pipelines 6” and larger shall be terminated with a fire hydrant for flushing purposes. 4” pipelines shall be terminated with a post type flushing hydrant with a single 2 ½”

nozzle. All hydrants shall be equipped with an isolation valve to allow for servicing without interruption of system flows. All potable water appurtenances that contact potable water shall bear the National Sanitation Foundation (NSF) seal of approval stating compliance with ANSI/NSF Standard 61. Post type hydrants shall not be used to support or provide fire flows.

B. Materials: Shop drawings and related data shall be submitted to the ENGINEER for review.
   1. Fire Hydrants shall be the cast iron, compression type, opening against pressure, and shall conform to ANSI/AWWA C502. Hydrants shall have a minimum 6" restrained mechanical joint connections with a minimum 5-1/4" main valve. Each fire hydrant shall have two 2-1/2" hose nozzles and one 4-1/2" pumper nozzle. Post type flushing hydrant shall be equipped with a single 2-1/2" nozzle. Hose connections shall have NST threads and comply with ANSI B26, but will not have chains attaching the caps to the upper barrel. Barrel lengths shall be for a 3-1/2 FT bury, except where other lengths are necessitated by the hydrant location and approved by the Engineer. Threads and operating nuts shall be identical to that of existing hydrants on the system.
   2. Hydrants shall be furnished with an O-ring sealed reservoir located in the bonnet so that all threaded and bearing surfaces are automatically lubricated when the hydrant is operated. Hydrant nozzles shall be O-ring sealed, threaded in place, and retained by stainless steel set screws or clips. Hydrant shall have a bronze seat ring that threads into a bronze drain ring. All working parts shall be removable without disconnecting the hydrant.
   3. Hydrants shall be furnished with a breakable feature designed to break cleanly upon impact and consisting of a two-part breakable safety flange or breakable lugs with a breakable stem coupling.
   4. All retaining bolts and hardware shall be 316 stainless steel.
   5. Upper and lower main stem rods shall be 316 stainless steel.
   6. All bronze or brass internal working parts in contact with service water shall be a maximum of 16% in zinc content and 79% minimum in copper.
   7. EPDM rubber shall be provided on all hydrant main valves.
   8. Interior coating shall be two part thermosetting or fusion bonded epoxy coated, holiday free to a minimum thickness of 4 mil, and conforming to "AWWA C550 protective interior coating for valves and hydrants."
   9. Exterior casting shall indicate type, main valve size, design, date of manufacture, and location of manufacture.
   10. Exterior coating shall be factory coated as follows:
      a. Hydrant barrel, caps and bonnet shall be painted Safety Yellow (Shermann Williams – Steel Master line #9500 Code- Safety Yellow B56Y300) or as required by local authority. Exterior hydrant parts below ground shall be coated with fusion bond epoxy coating, coated holiday free to a minimum thickness of 4 mil.
      b. Developer may choose a different fire hydrant color if developer maintains fire hydrant, and color is approved by the Engineer.
   11. All fire hydrant installations on paved roadways shall be provided with industry standard "blue hydrant reflector" installed in the center of the closet travel lane. Reflectors shall be SCDOT approved.
   12. Fire hydrants drains shall not be connected to or located within 10 feet of sewer system.

2.16 YARD HYDRANTS

A. Yard hydrants shall be anti-freezing and equipped with the following:
   1. Double - ball check valve on the drain that is vented to atmospheric air and has Teflon balls for zero percent water absorption.
   2. Vacuum breaker permanently attached to the outlet that prevents unwanted back-siphonage from an attached hose.
   3. Acceptable Model: Model BFH M-100 as manufactured by Murdock, Inc., Cincinnati, Ohio 45204.

2.17 THRUST RESTRAINTS

A. Mega-Lug restraints manufactured by EBBA.

B. Thrust restraints shall be used on all tees, bends, and plugs on lines 2.5 inches in diameter and larger, for all post hydrants on lines 3 inches in diameter and larger, and for all hydrants on lines 6 inches in diameter and larger.

2.18 TAPS

A. Where indicated or required, pipe or fittings shall be aped to receive small pipe or special fittings. Required taps shall be furnished as part of this work. Tap shall include all bosses or other fittings as necessary to provide the size tap needed.

2.19 BEDDING AND COVER MATERIALS

A. Bedding: as specified in municipality specification for material and compaction requirements

B. Cover: See municipality specification for proper material and compaction requirements.

C. Soil Backfill from Above Pipe to Finish Grade: Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter. Initial Backfill and final backfill shall be as specified in municipality specification.

2.20 VALVE BOXES

A. Provide at each buried valve.

B. Cast iron extension type, suitable for minimum cover of 3’6” over the pipe.

C. Minimum inside diameter at the top of 5”, minimum wall thickness 3/16”.

D. Have the word “WATER,” etc., as applicable, cast into the cover.

E. Provide Tyler Series 6850.

F. Where depth requires more than a two-piece box, use adjustable cast iron extensions.

G. Coat box and cover with two (2) shop coats of bitumastic paint.

2.21 VALVE BOX PROTECTION RING

A. Provide at each valve box a precast concrete protection ring.

B. Provide two rings of No. 3 reinforcing steel, one 14” in diameter, and one 23” in diameter.

C. Inside dimensions to be 9-1/4”.

D. Outside diameter to be 27”.

E. Provide 5” thickness at interior with a continuous slope to 2” thickness at the outside.

F. Minimum weight of 10 pounds.

PART 3 EXECUTION

3.1 PREPARATION

A. Precautions:
1. Pipe shall be installed at the locations shown on plans and to the position, alignment and grade shown on the drawings.
2. Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition.
3. Particular care shall be taken not to damage the pipe coating or lining.
4. If the coating or lining of any pipe or fitting is damaged, the repair shall be make as recommended by pipe manufacturer at the Contractor’s expense.
5. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied.
6. Pipe shall be carried into position and not dragged.
7. Use of the pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe.
8. The interior of the pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method.
9. Before installation, the pipe shall be inspected for defects.
10. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Owner.
11. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.
12. Polyvinyl chloride and fittings shall be handled and stored in accordance with the manufacturers recommendations.
13. Storage facilities shall be classified and marked in accordance with NFPA 704 with classification as indicated in NFPA 49 and NFPA 325M.

14. Coated and wrapped steel pipe shall be handled in conformance with AWWA C203.

B. Cutting of Pipe
   1. Cutting of pipe shall be done in a neat and clean manner without damage to the pipe.
   2. Cutting shall be done with an approved type mechanical cutter.
   3. Wheel cutter shall be used when practicable.
   4. Copper tubing shall be cut square and all burrs shall be removed.
   5. Squeeze type mechanical cutters shall not be used for ductile iron.
   6. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare pipe connections to equipment with flanges or unions.

3.2 BEDDING

A. Excavate pipe trench in accordance with municipality specification for work of this Section.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent maximum density.

C. Backfill around sides and to top of pipe in accordance with municipality specification.

D. Maintain optimum moisture content of fill material to attain required compaction density.

E. Place fill material in accordance with municipality specification.

3.3 PIPE INSTALLATION

A. Separation of Water Mains and Sewers: SCDHEC State Primary Drinking Water Regulation 61-58 [R.61-58.4.d, (12) (a)-(f)]
   1. Parallel Installation: Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, the Department may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.
   2. Crossings: Water mains crossing sewers shall be laid to provide a minimum vertical separation of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case whether the water main is either above or below the sewer line. Whenever possible, the water main shall be located above the sewer line. Where a new water main crosses a new sewer line,

a full length of pipe shall be used for both the water main and sewer line and the crossing shall be arranged so that the joints of each line will be as far as possible from the point of crossing and each other. Where a new water main crosses an existing sewer line, one full length of water pipe shall be located so both joints will be as far from the sewer line as possible. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer line to prevent damage to the water main.

3. Water mains shall be located out of contaminated areas, unless using pipe materials that will protect the quality of the water. The line should be rerouted if at all possible.
4. If water mains are installed above grade, the pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair and/or replacement.
5. Underwater Crossings – If water mains are to be placed underwater, a minimum of 2 feet cover shall be provided over the pipe. When crossing water courses that are greater than 15 feet in width, the following shall be provided:
   a. The pipe material and joints shall be designed appropriately.
   b. Valves shall be located so the section can be isolated for testing or repair and the valves on both sides of the crossing shall be easily accessible and not subject to flooding.
   c. A blow-off shall be provided on the side opposite the supply service sized in accordance with SC Regulation Section R.61-58.4 (D)(7).
   d. Use DIP with mechanical joints for any lines being installed in rock.
6. Special Conditions: When it is impossible to obtain the distances specified in R.61-58.4(D)(12)(a) and (b) the Department may allow an alternative design. Any alternative design shall:
   a. maximize the distances between the water main and sewer line and the joints of each;
   b. use materials which meet the requirements R.61-58.4(D)(1) for the sewer line; and,
   c. Allow enough distance to make repairs to one of the lines without damaging the other.
7. Force Mains: There shall be at least a 10 foot horizontal separation between water mains and sanitary sewer force mains. There shall be an 18 inch vertical separation at crossing as required in R.61-58.4(D)(12)(a) and (b).
8. Sewer Manholes: No water pipe shall pass through or come in contact with any part of a sewer manhole. Water lines may come in contact with storm sewers ro catch basins if there is no other practical alternative, provided that ductile iron is used, no joints of the water line are within the storm sewer or catch basin and the joints are located as far as possible from the storm sewer or catch basin.
9. Drain-fields and Spray-fields: Potable water lines shall not be laid less than 25 feet horizontally from any portion of a waste-water tile-field or spray-field, or shall be otherwise protected by an acceptable method approved by the Department.

B. All visible leaks shall be repaired regardless of the amount of leakage.

C. Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electrical wiring.

D. Nonferrous Metallic Piping: Where nonferrous metallic pipe, e.g., copper tubing, crosses any ferrous piping material, a minimum vertical separation of 12 inches must be maintained between pipes.

E. Placing and laying pipe:
   1. Carefully lower pipe and accessories into the trench. Do not drop or dump into the trench.
   2. Avoid abrasion of the pipe coating.
   3. Lay pipe with bell ends facing in the direction of laying.
   4. Rest pipe solidly upon the pipe bed; with recesses for bells, couplings, and joints.
   5. Relay pip if grade or joint has been disturbed.
   6. Do not lay pipe in water or when trench conditions are unsuitable for work.
   7. Keep water out of the trench until joining is complete.
   8. Securely close open ends, of pipe, fittings, and valves when work is not in progress.
   9. Repair damaged coating or lining according to manufacturer's instructions at Contractor's expense.
   10. Valve, plug, or cap, and anchor pipe ends left for future connections.

F. Joint Deflection:
   1. Ductile Iron Pipe: The maximum allowable defection will be as given in AWWA C600.
      a. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.
   2. Flexible Plastic Pipe: Maximum offset in alignment between adjacent pipe joints shall be as recommended by the manufacturers and approved by Engineer, but in no case shall it exceed 5 degrees.

G. Connections:
   1. Structures:
      a. Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 wall sleeves
      b. Annular space between walls and sleeves shall be filled with rich cement mortar.
      c. Annular space between pipe and sleeves shall be filled with mastic.
   2. New and existing mains:
      a. Use specials and fittings to suit actual conditions.
      b. Under pressure, connections shall be approved by Engineer.

H. Joining:
   1. Copper Tubing: Joints shall be made with flared fittings. The flared end tube shall be pulled tightly against the tapered part of the fitting by a nut which is part of the fitting, so there is metal to metal contact.
   2. Galvanize Pipe: Screw joints shall be made tight with stiff mixture of graphite and oil; inert filler and oil, or with an approved graphite compound applied with a brush to the male threads only. Do not use compounds containing lead.
   3. Ductile Iron Pipe:
      a. Mechanical and push-on type joints shall be installed in accordance with AWWA C600 for buried lines.

b. Clean socket and plain end thoroughly, removing mud, gravel, or other foreign matter.
c. Insert gasket into the gasket recess of the socket, large end of the gasket entering first. After gasket is in place at the bottom, the top of the gasket is positioned into the gasket recess. Warm gaskets to be installed in cold weather.
d. Apply a thin film of lubricant to the outside pipe surface between the stripe and the end of the pipe and also the inside surface of the gasket.
e. Do not allow pipe to touch ground or trench side after lubricating.
f. Insert plain end in the socket. Keep pipe in reasonably straight alignment. Push pipe until spigot end meets the full insertion mark.

4. PVC Pipe – Push-On
   a. Bevel ends for push-on to facilitate assembly and mark to indicate when the pipe is fully seated.
   b. Clean ring and spigot. Wipe the gasket, groove, and pipe free from foreign material.
   c. Install gasket with the flat surface facing inside the coupling, and the rounded edge facing the coupling entrance.
   d. Lower into trench slowly.
   e. Apply lubricant to gasket surface that is exposed, to the pipe spigot from the end to the full insertion mark, and the rounded edge and taper.
5. Connections between different types of pipe and accessories shall be made with transition fittings.

I. Place thrust restraints at each elbow or change of direction of pipe main.

J. Establish elevations of buried piping with not less than 3 ft of cover.

K. Install plastic ribbon tape continuous over top of pipe, 1-1/2 feet below finished grade.

L. Backfill trench in accordance with municipality specification.

M. Installation of water mains and appurtenances shall be conducted in accordance with Section C of the AWWA Standards and/or manufacturer's recommended installation procedures.

3.4 CROSS CONNECTION CONTROL (BACKFLOW PREVENTION DEVICES)

A. There shall be no connection between the water distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system.

B. No by-passes shall be allowed unless the by-pass is also equipped with an equal approved backflow prevention device.

C. High hazard cross connections shall require an air gap separation or approved reduced pressure backflow preventer.

D. Reduced Pressure Principle Backflow Preventer
   1. General:

a. ¾" through 2": Use Febco Model B25Y reduced pressure backflow preventer, or approved equal.
b. 2 ½" through 10": Use Febco Model B25YD reduced pressure backflow preventer, or approved equal.
c. Must be on the approved list published by SCDHEC and tested by a certified tester before placing into service and two (2) copies provided to Owner.
d. Bypasses not allowed unless equipped with an equal backflow protection.

2. ¾" through 2" reduced pressure backflow preventers to consist of the following:
   a. Two (2) independently operating, spring-loaded, "Y" pattern check valves and one (1) hydraulically dependent differential relief valve.
   b. Designed to automatically reduce the pressure in the zone between check valves to at least 5 psi lower than inlet pressure.
   c. The differential relief valve will open and maintain proper differential should differential between upstream and the zone to drop to 2 psi.
   d. Mainline valve body and caps including relief valve body and cover to be Bronze, ASTM B584-78.
   e. Center stem guided check valve moving member.
   f. All springs to be stainless steel, 300 series.
   g. Internally locate all hydraulic sensing passages within mainline relief valve bodies and relief valve cover.
   h. Diaphragm to seal area ratio to be 10:1 minimum, nitrile, fabric reinforced.
   i. Removable seat ring on relief valve.
   j. Construct check valve and relief valve components so they may be serviced without removing the valve body from the line.
   k. Reversible, nitrile ASTM D-2000 seats.
   l. Full ported ball valves for shut-off valves and test locks.
   m. Rate assembly to 175 psi water working pressure and water temperature range from 32°F to 180°F.
   n. Assemblies to meet requirements of ASSE Standard 1013; AWWA Standard Code C511-92, or latest revision; and USC Foundation of Cross Connection Control and Hydraulic Research, latest edition.
3. 2 ½" through 10" reduced pressure backflow preventers to consist of the following:
   a. Two (2) independent "Y" configured check valves and one (1) differential relief valve.
   b. To automatically reduce pressure in zone between check valves. Should differential between zone and upstream pressure drop to 2 psi, differential relief valve will open, maintaining proper zone differential.
   c. Series 300 stainless steel internal parts containing no dissimilar metals.
   d. Reversible elastomeric seat discs on check valves and relief valves. Seat rings to be B-61 Bronze or Series 300 stainless steel.
   e. Check assembly to be center stem guided at seat ring with replaceable non-corrosive bushings at the cover.
   f. Series 300 stainless steel relief valve spring.
   g. Design with ductile iron ASTM A-536, Grade 65-45-12 valve bodies and cover to withstand a 10:1 safety factor over rated cold water working pressure.
   h. Flanged ductile iron bodies, ANSI B16-1, Class 125, epoxy coated internally 10-20 mils.
   i. Located all orifices of the pressure sensing passages out of the normal debris flow path or settling areas.
   j. Copper, ASTM B-280 external sensing tubing.

k. Assemblies must be flanged, full port resilient wedge shut-off valves and four vandal resistant ball valve test cocks, integral to assemblies.
l. Factory-assembly and backflow test all assemblies.
m. Construct assemblies so all internal parts, including seat rings, can be serviced from the top or side removed while assemblies are in line.
n. Assemblies to be rated 175 MWWP (32°F - 140°F).

E. Double-Check Backflow Preventer
1. General:
a. 2 ½" through 10": Use Febco Model 805YD double-check backflow preventer, or approved equal.
b. Must be on the approved list published by SCDHEC and tested by a certified tester before placing into service and two (2) copies provided to Owner.
c. Bypasses not allowed unless equipped with an equal backflow protection.
2. 2 ½" through 10" double-check backflow preventers to consist of the following:
a. Two independent "Y" configured check valves.
b. Must be spring-loaded, center stem guided type.
c. Series 300 stainless steel integral parts.
d. Elastomeric seat disc must be reversible.
e. Bronze, ASTM B-61 or series 300 stainless steel seat rings bolted to valves bodies incorporating an o-ring to facilitate field removal and replacement.
f. Guide double-check assemblies at the seat ring and at the cover by replaceable non-corrosive bushings to assure positive check seating.
g. Head loss through assemblies not to exceed 5.5 psi at velocities from 0, up to and including 7.5 fps.
h. Document flow curves by independent laboratory testing.
i. Design ductile iron ASTM A536, Grade 65-45-12 valve bodies and cover to withstand 10:1 safety factor over rated cold water working pressure.
j. Ductile iron bodies flanged, ANSI B16-1, Class 125, epoxy coated internally 10-20 mils and prime coated externally.
k. Assemblies to include flanged, full port resilient wedge shut-off valves and four vandal-resistant full port ball valve test cocks, considered integral to assemblies.
l. Factory-assemble and backflow test all assemblies.
m. Construct double-check assemblies so all internal parts, including seat rings, can be serviced while in line.
n. Assemblies to be rated 175 MWWP (32°F - 140°F).
o. Assemblies to meet requirements of ASSE Standard 1015; AWWA Standard Code C510-92, or latest revision; and USC Foundation of Cross Connection Control and Hydraulic Research, latest edition.

F. Installation of Reduce Pressure Principle Backflow Preventer
1. General:
a. Minimum clearance of 12" and a maximum clearance of 30" between port and floor or grade.
b. Install where no discharge is objectionable and can be positively drained away.
c. Must be easily accessible for testing and maintenance and protected from freezing.
d. Eliminate excessive pressure situations to avoid possible damage to system and assemblies.

G. Installation of Double-Check Backflow Preventer
   1. Maintain adequate clearance and easy accessibility for testing and maintenance.

3.5 VALVE INSTALLATION

A. Set valves on compacted soil.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Locate valves outside the area of roads, driveways, and streets.

D. Carefully tamp earth fill around each valve box to a distance of 4 feet on all sides of the box, or the undisturbed trench face if less than 4 feet.

E. Valves after delivery shall be drained to prevent freezing and shall have interiors cleaned of all foreign matter before installation.

F. Stuffing boxes shall be tightened and the valve shall be fully opened and fully closed to insure that all parts are in working condition.

G. Installation of air release valves shall be at the high point of the line as indicated in the field.

H. The Contractor shall raise or lower existing and new valve boxes to the grades indicated on the drawings or relative to the surrounding finish grade. The frames and covers of the valve boxes which are not in paved areas or concrete areas shall be set approximately 0.1 foot above the surrounding grade within 10 feet of the valve box and the ground shall be sloped down and away from the elevation of the cover to points 10 feet from the valve box.

I. Replace any valve boxes damaged during the Work.

3.6 FIRE HYDRANT AND POST HYDRANT INSTALLATION

A. Fire hydrants shall, in general, be set well back of the curb or ditch line at the property line, with the break ring approximately 2” above finished grade or pavement elevation.

B. Fire hydrants shall not be lifted in a manner as to damage the factory-applied coatings. Fire hydrants damaged during installation shall be rejected.

C. Each hydrant shall be connected to an individual hydrant gate valve attached to a hydrant tee on the main line. Mechanical joint restraints shall be used on all fittings. Restraint rods or thrust blocking shall not be used unless approved by the Engineer.

D. Pipeline from hydrant tee and gate valve assembly to fire hydrant shall be a minimum of 6-inch diameter and constructed of ductile iron.

E. A minimum of 2 cubic feet of crushed stone shall be placed under and around the bottom of each hydrant to facilitate drainage. Crushed stone for the hydrant foundation shall be #57 stone.

F. Hydrant drains shall not be connected or installed within 10 feet of sanitary sewer systems.

G. Raise or lower existing and new hydrants, hydrant laterals, and shut-off valves (including boxes) as required, shown, or directed. Position the steamer connections facing the road.

H. Set hydrants plumb with steamer and nozzle centerline elevations 20 inches above finished grade, or match gradeline indicated on barrel of hydrants with finished grade. Provide thrust blocks and fill in around the drip or waste outlet at the bottom of each hydrant with not less than 5 cubic feet of crushed stone. At least one half of the stone shall be below the drip or outlet and compact additional fill around the hydrant to maintain hydrant stability and to insure against shock injury to the connections.

I. Adjust hydrant laterals, if required, to provide a minimum cover of 48 inches to finished grade.

J. Provide new stand pipe extension pieces as approved and alter or provide new stems. Provide concrete thrust blocks, gaskets, and straps as required.

K. Clean and paint all parts of the hydrants showing above the ground with two coats of paint.

L. Adjust valve boxes as required.

3.7 YARD HYDRANT INSTALLATION

A. Install yard hydrant in accordance with manufacturer’s instructions and recommendations.

B. Provide thrust blocks as indicated. Backfill with 2 cubic feet of crushed stone around the waste or drip outlet with 1/2 of the stone below the outlet. Arrange remaining balance of stone around hydrant to prevent damage to the connections from mechanical shock and to insure hydrant stability.

3.8 HYDROSTATIC TESTS

A. Perform hydrostatic tests at least 5 days after installation of the concrete thrust blocking. The method proposed for disposal of wastewater from hydrostatic tests and disinfection shall be submitted to Engineer for prior approval to performing hydrostatic tests.

B. After completion of pipeline installation, including backfill, but prior to final connection to existing system, conduct, in presence of Engineer, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600.

C. Provide equipment required to perform leakage and hydrostatic pressure tests.

D. Leakage Test
   1. Conduct concurrently with or after the pressure tests have been satisfactorily completed.
   2. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to 150 psi pressure or 1.5 times maximum working pressure which ever is greater.
   3. No pipeline installation will be approved when leakage is greater than that determined by the following formula:

Ductile Iron:	PVC:
$L=[SD(P)^{½}] \div 133,200$	$L = [ND(P)^{½}] \div 7,400$
L = allowable leakage (gals./hr)	L = allowable leakage (gals./hr)
S = length of the pipeline tested (feet)	N = # of joints in pipeline being tested
D = diameter of pipe (inches)	D = diameter of pipe (inches)
P = average test pressure (psig)	P = average test pressure (psig)

   4. When leakage exceeds specified acceptable rate, locate source and make repairs. Repeat test until specified leakage requirements are met.
   5. Repair all visible leaks regardless of test results.

E. Pressure Test
   1. Conduct hydrostatic test for at least two-hour duration.
   2. No pipeline installation will be approved when pressure varies by more than 5 psi at completion of hydrostatic pressure test.
   3. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, close corporation cocks and apply test pressure. At conclusion of tests, remove corporation cocks and plug resulting piping openings.
   4. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
   5. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.
   6. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Engineer when one or more of the following conditions is encountered:
      a. Wet or unstable soil conditions in the trench.
      b. Heavily used area that would require continuous surveillance to assure safe conditions.
      c. Maintaining the trench in an open condition would delay completion of the contract.
   7. An unforeseeable cause which would result in excess cost.

3.9 FIELD QUALITY CONTROL

A. Compaction Testing for Bedding: In accordance with municipality specification.
   1. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with municipality specification.

3.11 CLEANUP

A. Upon completion of the installation of the water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

END OF SECTION 331100

SECTION 333000 - SANITARY SEWER SYSTEMS

NOTE: CONTRACTOR SHALL COMPLY WITH THE STANDARD SANITARY SEWER SPECIFICATIONS FOR THE LOCAL MUNICIPALITY. CONTRACTOR TO ONLY USE THIS SECTION OF SPECIFICATIONS TO ADDRESS THOSE ITEMS NOT COVERED IN THE LOCAL MUNICIPALITY SPECIFICATIONS.

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 SECTION INCLUDES

A. Sanitary sewerage system outside the building to include piping, fittings, and accessories.

B. Connection of building sanitary sewer system to Utility Service/Municipality.

C. Monolithic concrete manholes with modular precast concrete or masonry transitions to lid frames, covers, anchorages, and accessories.

D. Modular precast concrete manhole sections, with tongue-and-groove joints, with modular precast concrete or masonry transitions to lid frames, covers, anchorages, and accessories.

E. Masonry manholes with masonry transitions to lid frames, covers, anchorages, and accessories.

F. Cleanout Access and Accessories.

1.3 RELATED SECTIONS

A. Section 31 2213 – Rough Grading.

B. Section 31 2316.13 – Trenching.

1.4 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

B. NPS: Nominal Pipe Size (Diameter).

C. ABS: Acrylonitrile-butadiene-styrene plastic.

D. EPDM: Ethylene-propylene-diene-monomer rubber.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

1.5 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

B. Force-Main Pressure Ratings: At least equal to system operating pressure, but not less than 150 psig.

1.6 SUBMITTALS

A. See Division 1 Specification Sections for additional submittal procedures.

B. Product Data: For the following:

1. Pipe and Accessories: Provide data including all types of piping, pipe accessories, joints, and fittings to be used.
2. Precast Manholes: Provide data for manhole covers (lids and frames), component construction, features, configuration, joints, inserts, and dimensions.
3. Backwater valves and cleanouts.

C. Shop Drawings: Include locations, plans, elevations, details, piping with sizes and elevations of penetrations, and attachments for the following:

1. Precast concrete manholes, including frames and covers.
2. Cast-in-place concrete manholes and other structures, including frames and covers.
3. Masonry manholes and other structures, including frames and covers.

D. Coordination Drawings: Show manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.

E. Coordination Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1-inch equals 50-feet and vertical scale of not less than 1-inch equals 5-feet. Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utilities crossing system piping.

F. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

H. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

I. Manufacturer's Certificate: Certify that products meet or exceed requirements of these specifications and authorities having jurisdiction.

J. Project Record Documents:

1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
2. Identify and describe unexpected variations in subsoil conditions or discovery of uncharted utilities.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.8 REGULATORY REQUIREMENTS

A. Conform to all applicable local and State codes for materials and installation of the Work of this Section.

B. Conform to the conditions and requirements of the SCDHEC Construction Permit.

C. Maintain materials and surrounding air temperature to minimum 50-degrees F prior to, during, and 48-hours after completion of masonry work.

D. Cold Weather Requirements: IMIAWC – Cold Weather Masonry Construction Guide – Specifications and Recommended Practices.

E. Comply with the U.S. Department of Health and Human Services/National Institute for Occupational Safety and Health DHHS (NIOSH) Publication No. 87-113, "A Guide to Safety in Confined Spaces" for all work within, or entries into, confined spaces.

1.9 PROTECTION OF EXISTING UTILITIES

A. Site Information: The approximate locations of known utilities are shown on the Drawings.

B. Site Investigation: Perform site survey, research public utility records, and verify existing utility locations. Locate the exact locations of shown utilities, and locations of any unknown utilities, within the work area using electronic pipe finder equipment or other approved methods.

C. Carefully excavate and expose existing underground utilities ahead of trenching operations.

D. Locate existing structures and piping to be closed and abandoned.

E. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify the Architect/Engineer not less than two (2) days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without the Architect/Engineer's written permission.
3. Repair or replace any damaged utility lines or structures to original condition at no additional cost to the Owner.

1.10 PROJECT CONDITIONS

A. Verify existing pipe sizes and invert elevations at tie-in points before commencing installation of pipe. Notify the Architect/Engineer immediately upon discovering any discrepancies from inverts shown on the Drawings.

B. Coordinate the Work with termination of sanitary sewer connections outside building, connections to Utility Service/Municipality, and trenching.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A74, Extra Heavy or Service type, gray iron, inside nominal diameter of 4 to 12 inches, bell and spigot ends, for gasketed joints. {For use only under buildings or future building locations, unless specifically noted otherwise on the Drawings.}

1. Gaskets: ASTM C564, rubber, compression type, thickness to match class of pipe.
2. Cast-Iron pipe and joints shall comply with ANSI A21.1, A21.6, A21.8, A21.10, and/or A21.11.

B. Ductile-Iron Sewer Pipe: ASTM A746, Pressure Class 350, with cement-mortar lining, inside nominal diameter of bell and spigot ends, for push-on joints.

1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
2. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
3. Gaskets: AWWA C111, rubber.

C. Stainless-Steel Drainage Pipe and Fittings: ASME A112.3.1; ASTM A666, Type 304, stainless steel; with socket and spigot ends for gasketed joints.

1. Couplings for NPS 6 to NPS 12: Stainless steel, mechanical type, with seal.

a. Seal Material for General Applications: EPDM, unless otherwise indicated.
b. Seal Material for Fluids Containing Gasoline or Oil: Nitrile-rubber compound, unless otherwise indicated.

D. ABS Sewer Pipe and Fittings: ASTM D2751, bell and spigot ends, for solvent-cemented or gasketed joints.

1. Wall Thickness for NPS 6 to NPS 12: SDR 42.
2. Gaskets: ASTM F477, elastomeric seals.

E. PVC Pressure Pipe: AWWA C900, Class 150, for gasketed joints.

1. PVC Pressure Fittings: AWWA C907, for gasketed joints.
2. Gaskets for PVC Piping: ASTM F 477, elastomeric seals.
3. Ductile-Iron, Compact Fittings: AWWA C153, for push-on joints.
4. Gaskets for Ductile-Iron Fittings: AWWA C111, rubber.

F. PVC Sewer Pipe and Fittings: According to the following:

1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D3034, SDR 35, for solvent-cemented or gasketed joints.

a. Gaskets: ASTM F477, elastomeric seals.

2.2 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Pressure-Type Pipe Couplings: AWWA C219, iron-body sleeve assembly matching OD of pipes to be joined, with AWWA C111 rubber gaskets, bolts, and nuts. Include PE film, pipe encasement.

B. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated. Include PE film, pipe encasement.

C. Ductile-Iron Deflection Fittings: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees deflection. Include PE film, pipe encasement.

D. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

2.3 PE FILM, PIPE ENCASEMENT

A. ASTM A674 or AWWA C105; PE film, tube, or sheet; 8-mil thickness.

2.4 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C478, precast, reinforced concrete, of depth indicated, with provisions for rubber gasketed joints.

1. Diameter: 48-inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
9. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
10. Steps: ASTM C478, individual steps or ladder. Omit steps for manholes less than 60-inches deep.
11. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic Precast Concrete Manholes: ASTM C913; designed according to ASTM C890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.

1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
2. Gaskets: ASTM C443, rubber.
3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
5. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
6. Steps: ASTM C478, individual steps or ladder. Omit steps for manholes less than 60-inches deep.
7. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete, as required to prevent flotation.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.

D. Manhole Frames and Covers: ASTM A536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "SANITARY SEWER" cast into cover.

E. Manhole Cover Inserts: Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent stormwater inflow. Include handle for removal and gasket for gastight sealing.

1. Type: Solid.

2.5 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C150, Type II.
2. Fine Aggregate: ASTM C33, sand.
3. Coarse Aggregate: ASTM C33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4,000-psi minimum, with 0.45 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A615, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4,000-psi minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 1-percent minimum through manhole.

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 4-percent minimum.

D. Ballast and Pipe Supports: Portland cement design mix, 3,000-psi minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A615, Grade 60, deformed steel.

2.6 MASONRY FOR MANHOLES

A. Concrete Brick Units: ASTM C55, Grade N, Type I–Moisture Controlled, Type II–Nonmoisture Controlled; normal weight, medium weight; nominal modular size of 2-1/4 x 3-5/8 x 7-5/8 –inches.

B. Mortar and Grout: Type S.

C. Reinforcement: Formed steel wire, 10/10 gage thick, galvanized finish.

2.7 PROTECTIVE COATINGS

A. Description: One- or two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:

1. Concrete Manholes: On interior surface.
2. Manhole Frames and Covers: On entire surfaces.

2.8 BACKWATER VALVES

A. Gray-Iron Backwater Valves: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.

1. Horizontal Type: With swing check valve and hub-and-spigot ends.
2. Combination Horizontal and Manual Gate-Valve Type: With swing check valve, integral gate valve, and hub-and-spigot ends.
3. Terminal Type: With bronze seat, swing check valve, and hub inlet.

B. PVC Backwater Valves: Similar to ASME A112.14.1, horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.9 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:

1. Light Duty: In earth or grass foot-traffic areas.
2. Medium Duty: In paved foot-traffic areas.
3. Heavy Duty: In vehicle-traffic service areas.
4. Extra-Heavy Duty: In roads.
5. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.10 PIPE ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6-inches wide and 4-mils thick, continuously inscribed with a description of the utility; colored as follows:

B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6-inches wide and 4-mils 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 deep; colored as follows:

1. Green: Sanitary Sewer systems.

2.11 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Sections 31 2323 – Fill and 31 2316.13 – Trenching.

B. Cover: As specified in Sections 31 2323 – Fill and 31 2316.13 – Trenching.

PART 3 - EXECUTION

3.1 EARTHWORK

A. See Sections 31 1000 – Site Grading and 31 2316.13 – Trenching for additional requirements.

B. Hand trim excavations for accurate placement of pipe to elevations indicated.

C. All sewer piping shall be installed with a minimum of 3-foot of cover.

D. Backfill around sides and to top of pipe with cover fill, tamp in-place and compact, and then complete backfilling.

3.2 SEWER LINE SEPARATION GUIDELINES

A. The location of Sanitary Sewer Lines in relation to Water Lines and Other Utilities shall comply with the requirements established by SCDHEC and “Ten State Standards”.

B. When Sanitary Sewers are proposed adjacent to any existing or proposed Potable Water Supply facilities, the following shall apply:

1. Potable Water Supply Interconnections:

a. There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenance thereto which may permit the passage of any sewage or polluted water into the potable water supply.
b. No potable water pipes shall pass through or come into contact with any part of a sewer manhole.

2. Horizontal and Vertical Separation from Potable Water Mains:

a. Sanitary Sewers shall be laid at least 10-feet horizontally from any existing or proposed Potable Water Line.
b. In cases where it is not practical to maintain a 10-feet horizontal separation, complying with one of the following conditions may allow, upon agency approval, installation of the Sanitary Sewer closer to a Potable Water Line:

1) The Potable Water Line is installed in a separate trench.
2) The Potable Water Line is installed on an undisturbed earth shelf located on one side of the Sanitary Sewer and at an elevation so that the bottom of the Potable Water Line is at least 18-inches above the top of the Sanitary Sewer Line.

3. Crossing:

a. Sanitary Sewers crossing Potable Water Lines shall be laid to provide a minimum vertical separation of 18-inches between the outside of the Potable Water Line and the Sanitary Sewer Line.
b. Whenever possible, the Potable Water Line shall be located above the Sanitary Sewer Line.
c. Where a new Sanitary Sewer Line crosses a new Potable Water Line, a full length of pipe shall be used for both the Sanitary Sewer Line and the Potable Water Line and the crossing shall be arranged such that the joints of each line shall be as far as possible from the point of crossing and from each other.
d. Where a Potable Water Line crosses under a Sanitary Sewer Line, adequate structural support shall be provided for the Sanitary Sewer Line to prevent damage to the Potable Water Line while maintaining line and grade.

3.3 IDENTIFICATION

A. Install continuous underground warning tape during backfilling of trench for all underground sanitary sewer piping. Locate below finished grade, directly over piping. See Section 31 1000 – Site Grading for underground warning tapes.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

B. Install warning tape a minimum of 12-inches below finish grade and directly above line of pipe.

3.4 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: The following piping can be used for the appropriate sizes:

1. Cast-Iron Soil Pipe and Fittings; Hub-and-spigot; Extra-Heavy class, gaskets, and gasketed joints.

a. Acceptable for Pipe Sizes NPS 4 to NPS 15.

2. Cast-Iron Soil Pipe and Fittings; Hub-and-spigot; Service class, gaskets, and gasketed joints.

a. Acceptable for Pipe Sizes NPS 4 to NPS 15.

3. Ductile-Iron Sewer Pipe; standard-pattern, ductile-iron fittings; gaskets, and gasketed joints.

a. Acceptable for Pipe Sizes NPS 4 to NPS 24.

4. Stainless-Steel Drainage Pipe and Fittings; gaskets, and gasketed joints. Use EPDM-compound gaskets, unless otherwise indicated. Use nitrile-rubber-compound gaskets for wastes containing gasoline or oil.

a. Acceptable for Pipe Sizes NPS 4 to NPS 12.

5. ABS, SDR 42, Sewer Pipe and Fittings; gaskets, and gasketed joints.

a. Acceptable for Pipe Sizes NPS 8 to NPS 12.

6. PVC Sewer Pipe and Fittings; gaskets, and gasketed joints.

a. Acceptable for Pipe Sizes NPS 4 and NPS 15.

7. PVC Sewer Pipe and Fittings; gaskets, and gasketed joints.

a. Acceptable for Pipe Sizes NPS 18 to NPS 24.

D. Force-Main Piping: Use the following:

1. Ductile-Iron Sewer Pipe; standard- or compact-pattern, ductile-iron fittings; gaskets, and gasketed joints.

a. Acceptable for Pipe Sizes NPS 3 to NPS 12.

2. PVC Pressure Pipe, PVC Pressure Fittings; gaskets, and gasketed joints.

a. Acceptable for Pipe Sizes NPS 4 to NPS 12.

3.5 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.6 INSTALLATION, GENERAL

A. Verify existing pipe sizes and invert elevations at tie-in points before commencing installation of sanitary sewer piping. Notify Architect/Engineer immediately upon discovering any discrepancies from inverts shown on the Drawings.

B. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

C. Verify that trench cut and excavation base is ready to receive Work and excavations, dimensions, and elevations are as indicated on the Drawings.

D. Protect pipe, fittings, and accessories during handling against impacts and free falls. Remove extraneous materials from interior of pipe.

E. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install piping, gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in pipeline, and pull past each joint as it is completed.

F. Lay each pipe to slope gradients shown on the Drawings in a manner to ensure a uniform slope gradient; with a maximum variation from true slope of 1/16-inch in 10-feet.

G. Before joining pipe, make sure all contact surfaces are clean and dry. Use gasket lubricants as recommended by pipe manufacturer.

H. Place, fit, join and adjust joints to obtain watertight seal.

I. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

J. Cut-off pipe at manholes flush with interior face of manhole wall to match the shape of the manhole wall.

K. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

L. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 2-percent, unless otherwise indicated.
2. Install piping with 36-inch minimum cover.

M. Terminate sanitary sewer piping 5’-0” from building exterior wall in locations(s) indicated. Provide temporary pipe plug for piping extending into building to be completed under Division 15 Work.

N. Install force-main piping between and connect to building's sanitary-drainage force main and termination point indicated.

1. Install piping with restrained joints at horizontal and vertical changes in direction. Use cast-in-place concrete supports and anchors or corrosion-resistant rods and clamps.
2. Install piping with 36-inch minimum cover.

O. Install ductile-iron, force-main piping according to AWWA C600.

P. Install PVC force-main piping according to AWWA M23.

Q. Install force-main piping between and connect to packaged sewage pump station outlet and termination point indicated.

R. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.7 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber gaskets, according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook." Use gaskets that match class of pipe and fittings.

1. Install PE film, pipe encasement over hub-and-spigot, cast-iron soil pipe and fittings according to ASTM A674 or AWWA C105.

C. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

1. Install PE film, pipe encasement over ductile-iron sewer pipe and ductile-iron fittings according to ASTM A674 or AWWA C105.

D. Stainless-Steel Drainage Piping: According to ASME A112.3.1 and manufacturer's written instructions.

E. ABS Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D2321.
2. Install according to ASTM D2321.

F. PE Pipe and Fittings: As follows:

1. Join pipe, tubing, and gasketed fittings with gaskets for watertight joints according to ASTM D2321 and manufacturer's written instructions.
2. Install according to ASTM D2321 and manufacturer's written instructions.

3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

G. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

H. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D2321.
2. Join profile sewer pipe fittings with gaskets according to ASTM D2321 and manufacturer's written instructions.
3. Install according to ASTM D2321.

I. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

J. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

K. Install with top surfaces of components, except piping, flush with finished surface.

3.8 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

D. Place concrete base pad, trowel top surface level and smooth.

E. Place manhole section plumb and level, trim to correct elevations, and anchor to base.

F. Install precast concrete manhole sections with gaskets according to ASTM C891. Provide rubber joint gaskets complying with ASTM C443 at joints and sections. Apply bituminous mastic coating at joints of sections.

G. Construct cast-in-place manholes as indicated.

H. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated metal items and accessories.

I. Cut and fit for pipe, conduits, sleeves, and other penetrations. Seal interface between manholes and piping (and pipe opening patch material) with epoxy bonding compound.

J. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

K. Set cover frames and covers level with tipping, to correct elevations.

L. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3-inches above finished surface elsewhere, unless otherwise indicated.

M. Install fiberglass manholes according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.10 BACKWATER VALVE INSTALLATION

A. Install horizontal units in piping where indicated.

B. Install combination units in piping and in structures where indicated.

C. Install terminal units on end of piping and in structures where indicated. Secure units to structure walls.

3.11 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Form bottom of excavation clean and smooth to correct elevation.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 x 18 x 12-inches deep. Set with tops 1-inch above surrounding grade.

E. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

F. Mount lid and frame level in grout, secured to top cone section.

3.12 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6-inches of concrete with 28-day compressive strength of 3,000-psi.

C. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6-inches of concrete with 28-day compressive strength of 3,000-psi.

D. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3-inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6-inches of concrete for minimum length of 12-inches to provide additional support of collar from connection to undisturbed ground.

1. Use concrete that will attain minimum 28-day compressive strength of 3,000-psi, unless otherwise indicated.
2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.13 FIELD QUALITY CONTROL

A. Perform Field Inspection and Testing in accordance with Division 1 Specification Sections.

B. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. Place plug in end of incomplete piping at end of day and when work stops.
2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

C. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24-inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and re-test at no additional cost to the Owner.

E. General Testing and Inspection:

1. All sewers will be visually inspected, tested, and gauged for infiltration and/or exfiltration.
2. All visible leaks shall be repaired even if infiltration is within allowable limits.
3. Broken or cracked pipe, mislaid pipe, and other defects shall be corrected.
4. All repairs, re-laying of sewers, etc., required to bring the sewers to specified status shall be made at no additional cost to the Owner.
5. Clean and prepare for inspection each block or section of sewer upon completion, or at such other time as directed by the Architect/Engineer.
6. Each section of pipe between manholes shall show a full circle of light when viewed from either end.
7. All testing is to be performed in the presence of the Architect/Engineer or other Owner Representative. Give at least three (3) day advance notice before performing tests.
8. All expenses for testing shall be borne by the Contractor.
9. In the event that the sewer line does not pass all testing, the Contractor shall make all necessary repairs, by a method approved by the Architect/Engineer, at no additional expense to the Owner.

F. Pressure Test: Test in accordance with SCDHEC and Municipal Authority and the following requirements:

1. When groundwater is less than 4-feet (1.2 m) above the top of the sewer pipe, sewers and appurtenances shall successfully pass an air test prior to acceptance.

a. Plug all wyes, tees, stubs, and service connections with gasket caps of plugs securely fastened or blocked to withstand the internal pressure test. Such plugs or caps shall be removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.
b. Furnish all necessary testing equipment and perform the test in a manner satisfactory to the Architect/Engineer. Any arrangement of equipment that will provide observable and accurate measurements of an air leakage under the specified condition with be permitted.
c. Testing of sections of the constructed sanitary sewer, for acceptance, will not be performed until all service connections, manholes, and

backfilling, and associated compaction, are completed between the stations to be tested.

d. Air Testing Procedure: After the plugs are in place and securely blocked, introduce air slowly into the pipe section to be tested until the internal air pressure reaches 4.0 psi greater than the average backpressure of any groundwater that may submerge the pipe. Allow a minimum of 2-minutes for the air pressure to stabilize. Determine the height of the groundwater table at the time of the test.

1) The pipe and joints shall be considered satisfactory when the time required, in seconds, for the pressure to decrease from 3.5 psi to 2.5 psi greater than the average backpressure of any groundwater that may submerge the pipe in not less than that computed in accordance with the following formulas:

a) T = (Pipe Diameter) (0.15)

T = Time per 100 feet

2) Conduct Air Tests complying with ASTM C828 or C924.

e. Subsequent Failure: Infiltration of groundwater in an amount greater than specified under Infiltration Testing, following a successful Air Test as specified, shall be considered as evidence that the original test was in error or that subsequent failure of the pipe has occurred.

G. Infiltration Test: Test in accordance with SCDHEC and Municipal Authority and the following requirements:

1. When groundwater is at least 4-feet above the top of the sewer pipe, an infiltration test will be used to determine the integrity of the sewer line.

a. If no leakage is observed, it can be assumed that the line passes the test.
b. If leakage is observed, conduct test using a V-notch sharp crested weir in a wood frame tightly secured to the manhole at the low end of the gravity sewer, or by direct measure, prior to allowing sewage flows in the line.

1) Close the end of the sewer at upstream structures sufficiently to prevent the entrance of water.
2) Discontinue the use of well points or other groundwater pumping operations at least three (3) days prior to testing.
3) Infiltration into the entire system of new sewers, or any one trunk, interceptor or outfall sewer, including connecting laterals, or any stretch of sewer shall not exceed:

a) 200 gal/day/inch of pipe diameter/mile of pipe.

H. Deflection Test: Test in accordance with SCDHEC and Municipal Authority and the following requirements:

1. Perform deflection test on all PVC sewer pipe.
2. No pipe to exceed a deflection of 5-percent.
3. Conduct deflection testing after the final backfill, and compaction thereof, has been in-place at least thirty (30) days and prior to placing the sewer line into operation.
4. Conduct Go/No Go deflection test using a rigid ball or mandrel have a diameter equal to 95-percent of the inside diameter of the pipe.
5. Do not use mechanical pulling devices for the deflection tests.

I. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.
5. If authorities having jurisdiction do not have published procedures, perform tests as follows:

    a. Sanitary Sewerage: Perform hydrostatic test.

        1) Allowable leakage is a maximum of 50 gal. per inch of nominal pipe size per mile of pipe, during 24-hour period.
        2) Close openings in system and fill with water.
        3) Purge air and refill with water.
        4) Disconnect water supply.
        5) Test and inspect joints for leaks.
        6) Option: Test ductile-iron piping according to AWWA C600, Section "Hydrostatic Testing." Use test pressure of at least 10 psig.

    b. Sanitary Sewerage: Perform air test according to UNI-B-6.

        1) Option: Test concrete piping according to ASTM C 924.

    c. Force Main: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than one and one-half times maximum system operating pressure, but not less than 150 psig.

        1) Ductile-Iron Piping: Test according to AWWA C600, Section "Hydraulic Testing."
        2) PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

6. Manholes: Perform hydraulic test according to ASTM C 969.
7. Leaks and loss in test pressure constitute defects that must be repaired.
8. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.14 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is completed.

END OF SECTION 333000

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SECTION 334200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stormwater drainage piping.
2. Manholes.
3. Catch basins.
4. Cleanouts.
5. Bedding and cover materials.

1.2 SUBMITTALS

A. Product Data: Manufacturer information describing pipe, pipe accessories, pre-cast concrete catch basins and manholes and clean-outs.

B. Manufacturer's Certificate: Products meet or exceed specified requirements.

C. Manufacturer Instructions: Special procedures required to install specified products.

1.3 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of pipe runs, connections, catch basins, cleanouts, invert elevations, and pipe slopes.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.4 QUALITY ASSURANCE

A. Perform Work according to SCDOT and local municipality standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials according to manufacturer instructions.

B. 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.

1.6 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. Ductile-Iron Piping:

1. Pipe:

a. Comply with ASTM A746, Class 50.
b. Type: Extra heavy.
c. Ends: Bell and spigot.

2. Fittings: Ductile iron.
3. Joints:

a. Comply with ASTM A746.
b. Joint Devices: Rubber gasket.

B. Reinforced Concrete Piping:

1. Pipe:

a. Comply with ASTM C76, Class III and IV, with Wall Type B.
b. Reinforcement: Mesh.
c. Inside Nominal Diameter: As noted on plans.
d. End Connections: Tongue and groove.

2. Fittings: Reinforced concrete.
3. Joints:

a. Comply with ASTM C443.
b. Gaskets: Rubber, compression and “o” ring.

C. PVC Piping (Roof and channel drain connectors only):

1. Pipe:

a. Comply with ASTM D2680, D3034; SDR 35.
b. Inside Nominal Diameter: As noted on plans.
c. Style: Bell and spigot with rubber-ring sealed gasket joint.

2. Fittings: PVC.
3. Joints:

a. Comply with ASTM F477.
b. Gaskets: Elastomeric.

D. Corrugated PE Piping:

1. Pipe:

a. Comply with ASTM F405, ASTM F667/F667M, AASHTO M252 and AASHTO M294.
b. Type: Perforated and Smooth interior.
c. Inside Nominal Diameter: As noted on plan.

2. Fittings: PE.
3. Joints: Comply with ASTM F405, ASTM F667/F667M, AASHTO M252, and AASHTO M294.

2.2 MANHOLES

A. Manhole Sections:

1. Materials:

a. Reinforced Precast Concrete: Comply with SCDOT standards.
b. Joints: Rubber gasketed. Comply with SCDOT standards.

B. Mortar and Grout:

1. Comply with SCDOT standards.

C. Shaft and Eccentric Cone Top Sections:

1. Pipe Sections: Reinforced precast concrete. Comply with SCDOT standards.
2. Joints:

a. Rubber gasketed. Comply with SCDOT standards.

3. Sleeved to receive pipe and/or conduit sections.

D. Frames and Covers:

1. Materials: Cast iron, heavy duty service.
2. Furnish materials according to SCDOT standards.

2.3 CATCH BASINS

A. Basins:

1. Material: Reinforced precast concrete, heavy traffic, structural loading. Comply with SCDOT standards.

2. Joints: Rubber gasketed. Comply with SCDOT standards.
3. Steps: Comply with SCDOT standards.
4. Pipe Connectors: Comply with SCDOT standards.

B. Grates and Frames:

1. Materials: Cast iron, heavy duty service.
2. Furnish materials according to SCDOT standards.

2.4 CLEANOUTS

A. Shaft and Top Section:

1. Material: PVC pipe sections, riser, and fittings.
2. Joints: Bell and spigot with rubber-ring sealed gasket.

B. Cleanout Lids:

1. Materials: PVC, same material as pipe.
2. Lid: Threaded plug

2.5 MATERIALS

A. Bedding and Cover:

1. Bedding: Comply with SCDOT standards.
2. Cover: Fill as specified in Section 310516 – Aggregates for Earthwork.
3. Soil Backfill from above Pipe to Finish Grade: Soil Type 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: Comply with SCDOT standards.

2.7 FINISHES

A. Steel Galvanizing:

1. Comply with ASTM A123/A123M.
2. Hot-dip galvanized after fabrication.

B. Galvanizing for Nuts, Bolts, and Washers: Comply with ASTM A153/A153M.

2.8 ACCESSORIES

A. Geotextile Filter Fabric: As specified in Section 310519.13 – Geotextiles for Earthwork.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation base is ready to receive Work of this Section.

B. Verify that excavations, dimensions, and elevations are as indicated.

3.2 PREPARATION

A. Correct over-excavation with fine aggregate or coarse aggregate as specified in Section 310516 – Aggregates for Earthwork.

B. 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 as specified in Section 312316 – Excavation and 312316.13 – Trenching.
2. Hand trim excavation for accurate placement of piping to indicated elevations.
3. Maintain optimum moisture content of bedding material to attain required compaction density.
4. Level fill materials in continuous layers not exceeding 8 inches in depth, and compact to 95 percent maximum density.
5. Place geotextile fabric over compacted bedding, if required.

B. Piping:

1. Pipe, Fittings, and Accessories: Comply with ASTM D2321.
2. Seal joints watertight.
3. Place pipe on minimum 4-inch-deep bed of No.57 filter 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 95 percent maximum density.
7. Backfilling and Compaction: As specified in Section 312323 – Fill.
8. Connect to municipal storm sewer system.

9. Install Site storm drainage system piping to within 5 feet of building or as shown in plans.

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.

D. 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 multi-section 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.
11. Set frames using mortar and masonry to indicated elevation.

3.4 TOLERANCES

A. Maximum Variation from Indicated Pipe Slope: 1/8 inch in 10 feet.

3.5 FIELD QUALITY CONTROL

A. Inspection:

1. Request inspection by Engineer prior to and immediately after placing aggregate cover over pipe.

B. Testing:

1. Do not enclose, cover, or put into service before inspection and approval.
2. Compaction Test:

    a. Comply with ASTM D1557, ASTM D698, and/or ASTM D6938 as applicable.
    b. Testing Frequency: In accordance with authorities having jurisdiction.

3. Piping Systems:

    a. In accordance with authorities having jurisdiction.
    b. Schedule tests and inspections by authorities having jurisdiction with at least 24 hour's advanced notice.

4. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.

3.6 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 334200

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SCHEDULE OF SPECIAL INSPECTION SERVICES

Report of Special Inspections

Project : Lancaster Restroom Building Permit Number: _____

Project Location: _____

Owner/Address: _____ City _____ Zip _____

Registered Design Professional In Responsible Charge: Jonathan Eric Pinto

Address: 100 Coastal Drive Suite 140

City: Charleston State: SC Zip: 29492 Phone: 843 352 7770

Fax: _____ E-mail: epinto@cranstonengineering.com

This statement of Special Inspections attached is submitted as a condition for permit issuance in accordance with Section 1704 of the 2015 International Building Code. It includes a Schedule of Special Inspection Services applicable to the above referenced project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the registered design professional in responsible charge at a frequency agreed upon by the permit applicant and building official prior to the start of work. Discrepancies shall be brought to the immediate attention of the contractor and design professional in responsible charge for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official by the registered design professional in responsible charge prior to the completion of that phase of work. A Final Report of Special Inspections shall be submitted by the design professional in responsible charge to the building official at the conclusion of the project and before a certificate of occupancy will be issued.

Statement of Special Inspections encompass the following disciplines:

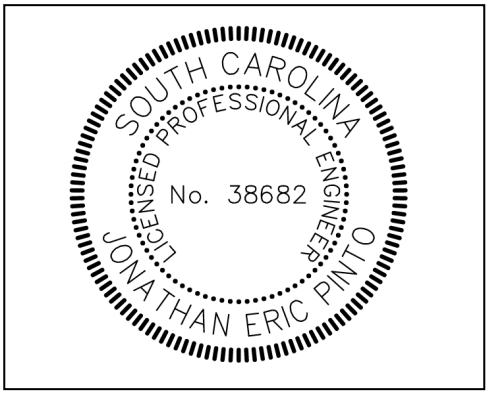
☒ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☐ Other: _____

Prepared by:

Jonathan Eric Pinto
Type or Print Name

Signature

12/12/2023
Date



Preparer's Seal and Signature Required

To be filled out by the jurisdiction and returned to applicant
Building Official's Acceptance of Special Inspections ☐ ☐

Frequency of Interim reports: Monthly Bi-Monthly ☐ Upon Completion ☐ Per Attached Schedule

Signature Date TMS Permit Number

SCHEDULE OF SPECIAL INSPECTION SERVICES

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☒ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☒ Masonry
- ☐ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☒ Wood Construction
- ☐ Architectural Components
- ☐ Mechanical & Electrical Systems
- ☐ Storage Racks
- ☐ Spray Fire Resistant Material
- ☐ Special Cases

Special Inspection Agencies	**Firm**	**Address, Telephone, e-mail**
1. **Special Inspection Coordinator**		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

SCHEDULE OF SPECIAL INSPECTION SERVICES

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official and shall be in accordance with the building code or any particular requirements of the specifications or material specific referenced standards. The credentials of all Inspectors and testing technicians shall be provided if requested.

Special Inspection Definitions

Continuous Special Inspection - Special inspection by the special inspector who is present when and where the work to be inspected is being performed.

Periodic Special Inspection - Special inspection by the special inspector who is intermittently present where the work to be inspected has been or is being performed. Unless noted otherwise 100% of the work designated for inspection shall be inspected.

SCHEDULE OF SPECIAL INSPECTION SERVICES

1705.1.1 Special Cases	
Post Installed Anchors	
Installer Qualifications	**Review** installer training records to confirm they have received manufacturer training per the contract documents
Anchor Installation	**Continuously** inspect complete process of anchor installation in accordance with requirements of approved ICC ESR report. As minimum review installation procedures including drill bit type, drilling methods, hole preparation and cleaning, spacing, edge distance, embedment depth, adhesive installation, rod installation, curing time, and anchor torque to ensure compliance with manufacturer's instructions and construction documents. (**All anchor holes must be inspected during drilling, all anchor holes must be inspected prior to anchor installation, all anchors shall be inspected at final application of required torque)**

1705.3 Concrete Construction	
Inspection of reinforcing steel, including prestressing tendons, and placement	**Periodically** inspect reinforcing steel placement in accordance with contract documents and approved shop drawings to confirm size, spacing, cover, positioning, bends, grade, laps, supports and anchorage. **(100% inspection rate immediately prior to placing concrete)**
Inspection of anchors cast in concrete	**Periodically** inspect size, positioning, embedment, and projection of anchor rods is in accordance with contract documents and approved shop drawings. **(100% inspection rate immediately prior to placing concrete)** **Continuously** inspect concrete placement and consolidation around anchors. **(100% inspection rate during concrete placement)**
Inspection of anchors post-installed in hardened concrete members.	**Review** installer training records to confirm they have received manufacturer training per the contract documents **Continuously** inspect complete process of anchor installation in accordance with requirements of approved ICC ESR report. As minimum review installation procedures including drill bit type, drilling methods, hole preparation and cleaning, spacing, edge distance, embedment depth, adhesive installation, rod installation, curing time, and anchor torque to ensure compliance with manufacturer's instructions and construction documents. (**All anchor holes must be inspected during drilling, all anchor holes must be inspected prior to anchor installation, all anchors shall be inspected at final application of required torque)**

SCHEDULE OF SPECIAL INSPECTION SERVICES

Verifying use of required design mix	**Periodically** review batch tickets to confirm the appropriate approved mix design is being used for the location in which concrete is being placed **(100% review rate during concrete placement)** **Periodically** verify that water added at the site does not exceed that allowed by the batch ticket **(100% inspection rate during concrete placement)**
Sample fresh concrete to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of concrete	**Continuously** test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064). (**Frequency of sampling and testing as required by section 5.6.2 of ACI 318)**
Inspection of concrete for proper application techniques	**Continuously** inspect concrete placement techniques to confirm compliance with sections 5.9 and 5.10 of ACI 318.
Inspection for maintenance of specified curing temperatures and techniques	**Periodically** inspection curing temperatures and techniques to insure compliance with contract documents and sections 5.11-5.13 of ACI 318

SCHEDULE OF SPECIAL INSPECTION SERVICES

1705.4 Masonry Construction	
Inspection of formwork for shape, location and dimensions of concrete member being formed	**Periodically** inspect formwork to ensure compliance with dimensions of members indicated on contract documents **(100% inspection rate during concrete placement)**
Verify compliance with approved submittals	**Periodically** review batch tickets to confirm the appropriate approved grout mix design is being used. **(100% review rate during grout placement)** **Periodically** review mortar materials to confirm compliance with approved submittals. **(A minimum of once weekly during masonry construction)**
Verify proportions of site prepared mortar	**Periodically** inspect proportioning, mixing and re-tempering of mortar. **(A minimum of once daily during masonry construction)**
Inspect construction of mortar joints	**Periodically** inspect construction of mortar joints including tooling and filling of head joints. **(100% inspection rate a minimum of once daily during masonry construction)**
Inspect location of reinforcement and connectors	**Periodically** inspect placement, positioning and lapping of reinforcing steel **(100% inspection rate a minimum of once daily during masonry construction)** **Periodically** inspect size, grade and type of reinforcing. **(100% inspection rate a minimum of once daily during masonry construction)** **Continuously** inspect placement positioning and lapping of joint reinforcement. **(100% Inspection rate – inspector shall be in the area of masonry work to monitor installation)** **Periodically** inspect size, grade, type and location of anchor rods and embeds. **(100% inspection rate a minimum of once daily during masonry construction)**
Inspect Grout Space	**Periodically** grout spaces to ensure minimum clear grout spaces are achieved, and that grout spaces are free from debris, mortar fins and mortar droppings. Confirm mortar fins and mortar droppings are being manually removed as masonry is constructed. **(100% inspection rate a minimum of once daily during masonry construction)**
Verify size and location of structural masonry elements	**Periodically** inspect the size and location of structural elements to comply with contract drawings. **(100% inspection rate a minimum of once daily during applicable portion of the work)**

SCHEDULE OF SPECIAL INSPECTION SERVICES

1705.4 Masonry Construction (Continued)	
Verify protection of masonry during hot/cold weather	**Periodically** inspect protection of masonry during cold weather (temperature below 40 deg F) or hot weather (temperature above 90 deg F) **Periodically** verify that all wall cavities are protected against precipitation. **(100% inspection rate a minimum of once daily during applicable portion of the work)**
Verify grout placement complies with code and construction document provisions	**Continuously** inspect placement, consolidation and reconsolidation of grout. **(100% inspection rate)** **Continuously** verify grouting and grout consolidation procedures are in accordance with code and contract document provisions. **(100% inspection rate)**
Evaluation of grout Strength	**Continuously** Test compressive strength of grout samples (ASTM C1019). (**Sample and test grout for every 5000 sq ft. of wall, but not less than one set of samples for each day's worth of grouting)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.5 Wood Construction	
Inspection of High-Load Diaphragms	**Periodically** inspect wood structural panel diaphragms to verify the sheathing material thickness and grade complies with the requirements of the construction documents. **(100% inspection rate)** **Periodically** inspect nominal size of wood framing members at adjoining panel edges, blocking as specified at panel edges, nail or staple diameter and length, number of fastener lines, and that spacing between fasteners at each line and at edge margins agrees with construction documents. **(100% inspection rate)**

SCHEDULE OF SPECIAL INSPECTION SERVICES

1705.6 Soils	
Verify materials below shallow foundations are adequate to achieve the design bearing capacity	**Periodically** inspect soils within building footprint for adequate bearing capacity and consistency with the geotechnical report**.** **(100% inspection rate)**
Verify excavations are extended to proper depth and have reached proper material	**Periodically** inspect all footing excavations to ensure they are to proper depth and have reached proper material as indicated on contract documents and/or geotechnical report. **(100% inspection rate immediately prior to placement to reinforcing steel for foundations)** **Periodically** inspect all unsuitable material excavations to ensure they are to proper depth and have reached proper material as indicated on contract documents and/or geotechnical report. **(100% inspection rate of all areas of unsuitable fill removal immediately prior to placement of fill)**
Perform classification testing of compacted fill materials.	**Periodically** perform testing of fill materials to ensure compliance with contract documents and geotechnical report. Classification and testing shall be in accordance with the Geotechnical report. Where the geotechnical report does not specifically indicate testing, the minimum testing shall be sieve tests (ASTM D422 & D1140) and Standard Proctor tests (ASTM D98). **(Testing shall be completed for each source of material, or where obvious changes of properties of fill materials are realized)**
Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill	**Continuously** verify materials for compacted fill to ensure materials have been previously tested and are in compliance with the contract documents and geotechnical report. **(100% inspection rate)** **Periodically** test density of each lift of fill within the building footprint to confirm compliance with compaction requirements outlined in the contract documents and geotechnical report. **(Where inspection rates are not indicated in the geotechnical report, not less than one test per each lift per 2000 sq ft of fill placed)** **Continuously** verify lift thicknesses are during placement of compacted fill to ensure lift thickness is in compliance with the contract documents and geotechnical report. **(100% inspection rate)**
Prior to placement of compacted fill, inspect subgrade and verify that the site has been prepared properly.	**Periodically** inspect subgrade within the building footprint prior to placement of compacted fill to ensure subgrade complies with contract documents and geotechnical report. **(100% inspection rate of all areas immediately prior to placement of fill)**