BID SET

PROJECT MANUAL

SOUTH HILL NEW POLICE STATION
TOWN OF SOUTH HILL, VIRGINIA
ARCHITECT'S PROJECT NO.: 651033

Moseley

ARCHITECT/ENGINEER — RICHMOND, VIRGINIA

B & B CONSULTANTS, INC.

CIVIL ENGINEER — SOUTH HILL, VIRGINIA

October 21, 2026

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INVITATION TO BID

Bid Request No. 2026-11

Sealed bids for construction of the **South Hill New Police Station** will be received in person, via regular mail by U.S. Postal Service, or via special courier service at **211 S. Mecklenburg Avenue, South Hill, VA 23970**, until but no later than **2:00 p.m.**, local prevailing time, **December 2, 2026**, and then publicly opened and read immediately thereafter.

Bids received after the announced time and date for submittal, whether by mail or otherwise, will be rejected. Bidders are responsible for ensuring their Bid is received before the deadline indicated. Bids submitted by telephone, text message, email, or facsimile shall not be accepted.

Only General Contractors who were determined to be qualified through the Town of South Hill's Prequalification to Bid Process are eligible to submit a construction bid for this Project. (General Contractors are the only contractors required to prequalify to bid for the Project. Subcontractors are not required to prequalify.)

The Work generally consists of the heavy renovation of the existing bank building, two one-story additions, and various site improvements including secure staff parking, public parking, and a patio for staff.

A **non-mandatory** pre-bid conference and site visit will be held at **10:00 a.m.**, on **November 9, 2026**, at **111 E. Danville Street, South Hill, VA 23970**. Pre-bid questions will not be answered at the pre-bid conference; submit questions via the process below.

Responses to any questions/ clarification will be in the form of addenda if required. Questions/clarifications shall be placed by **5:00 p.m. EST** on **November 16, 2026**. Submit questions online via process below. Responses will be in the form of addenda if required.

Bidders may obtain Bidding Documents electronically by visiting e-VA, the Town of South Hill website, or www.moseleydesigns.com.

Bidders may submit Pre-Bid Questions by visiting www.moseleydesigns.com. At the top-right of the website select the three lines to open the menu, then select "Bidding" from the listing, and find the applicable project.

To obtain Bidding Documents select the "Bid Documents" link and complete the Bid Documents Request Form to receive a key that will allow access to the documents. To submit a pre-bid question, select the "Submit a Question" link.

Only Bidders or entities who obtain Bid Documents through Moseley Architects via the electronic process above will be considered Planholders. All others who obtain electronic Bid Documents or hard/paper Bid Documents through other means, including Plan Rooms, other Contractors, Owner, or third-party websites (ConstructConnect, Dodge, iSqFt., etc) are not considered Planholders. Only Planholders will be notified of Addenda.

Refer to the Instructions to Bidders for bidding procedures and requirements.

The Town of South Hill does not discriminate against faith-based organizations.

END OF INVITATION TO BID

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Instructions to Bidders

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

South Hill New Police Station

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

Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

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

Moseley Inc.
3200 Norfolk Street
Richmond, VA 23230

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ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes 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 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.

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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, but are subject to and governed by definitions under applicable laws and regulations.

§ 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 in conformance with 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.

§ 1.10 A Responsible Bidder means a person or entity that has the capability, in all respects, to perform fully the Contract requirements and the moral and business integrity and reliability that will assure good faith performance.

§ 1.11 A Responsive Bidder means a person or entity that has submitted a Bid which conforms in all material respects to the Invitation to Bid and requirements of the Bidding Documents.

§ 1.12 An informality means a minor defect or variation of a Bid from the exact requirements of the Invitation to Bid and of the Bidding Documents which does not affect the price, quality, quantity or delivery schedule for the goods, services or construction being procured.

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

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.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.

.7 The Bidder has carefully reviewed the Bidding Documents and has verified that all of the Bidding Documents received are complete. The Bidder shall notify the Architect immediately if received Bidding Documents are not complete.

.8 The Bidder has familiarized itself with all applicable federal, state and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work; the Bidder has obtained the necessary licenses for bidding, if applicable, and is licensed or certified to perform the Work.

.9 The Bidder shall pay all county, city, state and federal taxes required by laws in effect at the time the Bids are received and resulting from the Work or traceable thereto. Said taxes shall not be in addition to the Contract price between the Owner and the Bidder, as the taxes shall be an obligation of the Bidder and not of the Owner, and the Owner shall be held harmless and indemnified for the same by the Bidder.

.10 The failure or omission of any Bidder to receive or examine any form, instrument, addendum or other documents, or to acquaint itself with conditions existing at the site(s), shall in no way relieve any Bidder from any obligations with respect to its Bid or to the Contract.

.11 The Bidder agrees that its Bid shall be based on products and work indicated in the Bidding Documents.

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.

§ 3.1.2.1 When the Bidding Documents are returned by the Bidders to the Architect or Owner, the shipping or postage shall be prepaid by the Bidder. The Bidder's deposit will not be refunded if the deposit sum is non-refundable as indicated in the Advertisement or Invitation to Bid.

§ 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.

§ 3.1.4.1 Every Bidder is responsible to review all Bidding Documents received to verify that each set contains a complete set of Contract Documents. Any incomplete Bidding Documents shall be immediately returned to the Architect.

§ 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.

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(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.

§ 3.3.1.1 The Bidder assumes all risks using a price or bid proposal representing a product or Work that is not indicated in the Bidding Documents and, if the Bidder elects to use that product or Work he shall submit it in accordance with the Division 1 requirements, and as stated herein. If that product or Work is rejected, the Bidder shall provide a product or Work indicated in the Bidding Documents at its cost. The Architect and the Owner shall not consider any requests for additional payments to provide the Work as required by the Contract Documents.

§ 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 provided in the Bidding Documents.

§ 3.3.2.3 DELETE THIS PROVISION. MAINTAIN ONLY IF A SUBSTITUTION FORM IS NOT INCLUDED IN THE SPECS 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.)

Copies of the Addendum will be posted electronically and a notice of posting will be sent via facsimile/email to each plan holder of record.

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

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§ 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.

§ 3.4.3.1 Depending on the nature of an Addendum (clarifications, limited scope of revisions, added manufacturers) issued less than four days prior to receipt date, the Architect, in its professional judgment, reserves the right to issue said Addendum without postponement of the bid date. However, if in the professional judgment of the Architect, the information contained in the Addendum would be such that it would be unfair or unreasonable to prepare a bid proposal based on the revisions in the Addendum, then the bid date will be postponed to allow distribution of the Addendum and time to prepare a bid proposal.

§ 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 Where so indicated by the bid form, all amounts shall be expressed in figures only.

§ 4.1.4 All changes made by the Bidder to the bid form or outside of the envelope shall be signed or initialed by the Bidder. Bids containing any conditions, omissions, erasures, alterations, or items not called for in the Bid, may be rejected by the Owner as being incomplete or nonresponsive.

§ 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. If the Bidder does not desire to bid on an Alternate, enter the words "No Bid". If the Owner elects to accept an Alternate, all Bidders submitting a "No Bid" for the Alternate selected by the Owner will be ruled nonresponsive and their Bid will not be considered in the award of the Contract. If the Bidder does not enter an Alternate Bid amount, "No Change", or 'No Bid" for all requested Alternates, and leaves the Alternate information blank, their Bid will be considered nonresponsive and will not be considered in the award of the Contract.

§ 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 bid security in the form of either a cashier's or certified check or an acceptable Bid Bond in the amount of five percent (5%) of the Bid amount, and made payable to the Town of South Hill, Virginia . The bid security is a guarantee that if the Contract is awarded by the Owner to the Bidder, the Bidder shall enter into the Contract with the Owner for the Work mentioned in this Bid or forfeit the bid security to the Owner, not as a penalty, but as liquidated damages. No forfeiture under a bid security shall exceed the lesser of

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(i) the difference between the Bid for which the bid security was written and the next low Bid of another Bidder, or
(ii) the face amount of the bid security.
(Insert the form and amount of bid security.)

§ 4.2.2 All bonds shall be executed by a surety company selected by the Bidder which is legally authorized to do business in the Commonwealth of Virginia **]**, and the bond shall be the same in both form as well as substance as AIA Document A310, Bid Bond. The Bidder shall require the attorney-in-fact, who executed the required bond on behalf of the surety company, to affix thereto a certified and current copy of the power of attorney. The bond premium shall be paid by the Bidder and the cost shall be included in the Bid.

§ 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, beginningdays 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.)

§ 4.3.1.1 All public contracts with nongovernmental contractors for the purchase or lease of goods, or for the purchase of services, insurance, or construction, shall be awarded after competitive sealed bidding, or competitive negotiation as provided in Virginia Code §2.2-4303, unless otherwise authorized by law. All state public bodies accepting bids or proposals for contracts pursuant to The Virginia Public Procurement Act, Virginia Code §2.2-4300 et seq., shall provide an option to submit bids or proposals through the Commonwealth's statewide electronic procurement system, known as eVA. The Director of the Department of General Services, or his designee, may grant an exemption from such requirement at the request of a state public body and upon a showing of good cause. All local public bodies shall provide an option to submit bids or proposals through eVA or other electronic means. In cases where bids or proposals are submitted electronically, the local public body may also require a certain number of paper submissions for review purposes.

§ 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.

§ 4.3.2.1 The Bidder shall place on the outside of the envelope containing its Bid the following notation: "Contractor License Number _____ and Class of License."

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§ 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.

§ 4.3.6 In the solicitation or awarding of Contracts, the Owner shall not discriminate because of the race, religion, color, sex, age, disability or national origin of the Bidder. The Owner welcomes and encourages the participation of small businesses and businesses owned by women and minorities in procurement transactions made by the Owner.

§ 4.3.7 Trade secrets or proprietary information submitted by a Bidder in connection with a procurement transaction, shall not be subject to public disclosure under the Freedom of Information Act; however, the Bidder must invoke the applicable protection, prior to or upon submission of the data or other materials, and must identify the data or other materials to be protected and state the reasons why protection is necessary. The Owner will not accept responses to the Invitation to Bid in cases where the Bidder declares the entire response to the Invitation to Bid to be proprietary information. The Bidder must designate, in the smallest increments possible, that part of the Bid which is deemed to be proprietary.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder after the time and date designated for the receipt of Bids and for sixty-one (61) calendar days thereafter except as provided in subparagraph 4.4.3 of these Instructions to Bidders and each Bidder so agrees in submitting a Bid.

§ 4.4.1.1 A Bid may be modified or withdrawn by the Bidder any time prior to the time and date set for the receipt of Bids. The Bidder shall notify the Owner in writing of its intentions. Such notice shall be in writing over the signature of the person who submitted the original Bid and the notice shall be received and date and time stamped by the Owner on or before the date and time set for the receipt of Bids.

§ 4.4.1.2 Bidders may indicate modifications to Bid amounts by writing the modification on the outside of the sealed envelope containing the Bid and initialing the modification. Only the Bid amount may be modified by this means; no other qualifications may be made.

§ 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 A Bidder may withdraw its Bid from consideration if the Bid price was substantially lower than other Bids due solely to a mistake therein, provided the Bid was submitted in good faith, and the mistake was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of Work, labor made directly in the compilation of a Bid which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the Bid sought to be withdrawn. If a Bid contains both clerical and judgment mistakes, a Bidder may withdraw its Bid from consideration if the Bid would have been substantially lower than the other Bids due solely to the clerical mistake, that was an unintentional arithmetic error or an unintentional omission of a quantity of Work, labor or material made directly in the compilation of a Bid which shall be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the Bid sought to be withdrawn.

§ 4.4.3.1 The Bidder shall submit to the Owner its original work papers, documents and materials used in the preparation of the Bid within one (1) day after the date fixed for submission of Bids. Such work papers shall be delivered to the Owner by the Bidder in person or by registered mail at or prior to the time fixed by the Owner for the opening of Bids. The Contract shall not be awarded by the Owner until such period has elapsed. Such mistake shall be proved only from the original work papers, documents, and materials delivered to the Owner as required herein.

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§ 4.4.3.2 No Bidder who is permitted to withdraw a Bid shall for compensation, supply any material or labor to or perform any subcontract or other work agreement for the person or firm to whom the Contract is awarded or otherwise benefit directly or indirectly from the performance of the Work for which the withdrawn Bid was submitted.

§ 4.4.3.3 If a Bid is withdrawn under authority of this section, the next lowest responsive and responsible Bidder shall be deemed to be the low Bidder.

§ 4.4.3.4 When the procedure set forth in the paragraphs above is utilized, original work papers, documents, and materials used in the preparation of the Bid must be submitted in an envelope or package separate and apart from the envelope containing the Bid marked clearly as to the contents.

§ 4.4.3.5 If the Owner denies the withdrawal of a Bid under the provisions of this section, it shall notify the Bidder in writing stating the reasons for its decision and award the Contract to such Bidder at the Bid price, provided such Bidder is a responsible and responsive Bidder.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

All Bids received on time in accordance with the Bidding Document requirements shall be opened and publicly read aloud. Any Bidder, upon request, shall be afforded the opportunity to inspect Bid records within a reasonable time after the opening of all Bids but prior to award, except in the event that the public body decides not to accept any of the Bids and to reopen the Contract. Otherwise, Bid records shall be open to public inspection only after award of the Contract. Any inspection of procurement transaction records shall be subject to reasonable restriction to ensure the security and integrity of the records.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or not in conformance with requirements of the Bidding Documents is subject to rejection.

§ 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 and does not exceed the funds available. 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 own best interests.

§ 5.3.1.1 In determining the lowest responsible Bidder, the Owner may consider, among other things, the Bidder's past performance, conduct on other contracts, and other information provided by the Bidder, including in the Contractor's Pre-Qualification Package, if requested.

§ 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.

§ 5.3.3 In case of a tie Bid, preference may be given to goods, services, and construction produced in Mecklenburg County or the Commonwealth of Virginia or provided by persons, firms or corporations having principal places of business in Mecklenburg County or the Commonwealth of Virginia , if such a choice is available; otherwise the tie shall be decided by lot. A Mecklenburg County business may be given preference over a Commonwealth of Virginia business, if such a choice is available.

§ 5.3.4 If a Contract is to be awarded, the Owner will give the Bidder a Notice of Award within sixty (60) calendar days after the day of the Bid opening.

§ 5.4 NEGOTIATION WITH LOWEST RESPONSIVE AND RESPONSIBLE BIDDER

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§ 5.4.1 If award of a Contract to the lowest responsive and responsible Bidder is precluded because of limitations on available funds, the Owner reserves the right to negotiate the Bid amount with the lowest responsive, responsible Bidder to obtain a Contract amount within the available funds. The negotiations may involve changes in either the features or scope of the Work. Such negotiations may include reducing the quantity, quality, or other cost saving mechanisms involving items in the Bid amount, including unit prices (if any) and/or allowances (if any) that affect the Bid amount, and/or Alternates (if any).

§ 5.4.2 The Owner shall notify the lowest responsive and responsible Bidder that such a situation exists and the Owner and Bidder shall then conduct their negotiations in person, by mail, by telephone or by any means they find convenient.

§ 5.4.3 If an acceptable Contract can be negotiated, the changes to the Bid amount and Bidding Documents agreed upon in the negotiations shall be summarized in a "Post Bid Addendum," and included in the Contract.

§ 5.4.4 If the Owner and the lowest responsive and responsible Bidder cannot negotiate a Contract within available funds, the Owner shall terminate negotiations and reject all bids.

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 in writing if either the Owner, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution, provided such adjustment in cost is justifiable and reasonable. 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 has 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.

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ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 The successful Bidder shall furnish a Performance Bond covering the faithful performance of the Contract and a Payment Bond covering the payment of all obligations arising thereunder. Each bond shall be written for the full value of the Contract, including all adjustments as authorized by Change Order.

§ 7.1.2 All bonds shall be written by sureties or insurance companies licensed to do business in the Commonwealth of Virginia.

§ 7.1.3 The bond premiums shall be paid by the successful Bidder and the cost shall be included in the Bid price. Any subsequent bond premium costs shall be as authorized by Change Order.

§ 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 successful Bidder shall deliver the required bonds along with the signed Contract (Agreement) forms and the required Certificate of Insurance to the Owner within fifteen (15) calendar days after the Notice of Award of the Contract.

§ 7.2.2 The bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Each bond shall be written for the full amount of the Contract.

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

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

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

§ 8.1 Unless otherwise required in the Bidding Documents, the Contract for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

§ 8.2

THE CONTRACTOR RECOGNIZE THAT TIME IS OF THE ESSENCE AND THAT THE OWNER WILL SUFFER FINANCIAL LOSS IF THE WORK IS NOT COMPLETED BY THE SUBSTANTIAL COMPLETION DATE REQUIRED OR AS MAY BE AMENDED BY THE CONTRACT DOCUMENTS. CONTRACTOR RECOGNIZES THE DELAYS, EXPENSES AND DAMAGES THAT ARE INVOLVED IN PROVING IN A LEGAL PROCEEDING THE ACTUAL LOSS THAT MAY BE SUFFERED BY THE OWNER IF THE WORK IS NOT COMPLETED ON TIME. ACCORDINGLY, THE OWNER AND THE CONTRACTOR AGREE, STIPULATE AND FIX AS LIQUIDATED DAMAGES IF DELAYED, BUT NOT AS A PENALTY, THE SUM INDICATED ON THE BID FORM THAT THE CONTRACTOR TOGETHER WITH THE CONTRACTOR'S SURETY SHALL PAY THE OWNER FOR EACH CALENDAR DAY OR PART THEREOF THAT EXPIRES AFTER THE DATE REQUIRED OR AS MAY BE AMENDED BY THE CONTRACT DOCUMENTS FOR THE SUBSTANTIAL COMPLETION OF THE WORK.

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§ 8.3 The Contractor recognizes that time is of the essence and that the Owner will suffer financial loss if the Work is not completed by the Final Completion date required or as may be amended by the Contract Documents. The Contractor recognizes the delays, expenses and damages that are involved in proving in a legal proceeding the actual loss that may be suffered by the Owner if the Work is not completed on time. Accordingly, the Owner and the Contractor agree, stipulate and fix as liquidated damages if delayed, but not as a penalty, the sum indicated on the Bid Form that the Contractor together with the Contractor's surety shall pay the Owner for each calendar day or part thereof that expires after the date ~~indicated~~ required or as may be amended by the Contract Documents for the Final Completion of the Work.

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Additions and Deletions Report for
AIA® Document A701® – 2018

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PAGE 1:

South Hill New Police Station

Town of South Hill, Virginia

211 S. Mecklenburg Avenue

South Hill, VA 23970

Moseley Inc.

3200 Norfolk Street

Richmond, VA 23230

PAGE 2:

§ 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, but are subject to and governed by definitions under applicable laws and regulations.

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

§ 1.10 A Responsible Bidder means a person or entity that has the capability, in all respects, to perform fully the Contract requirements and the moral and business integrity and reliability that will assure good faith performance.

§ 1.11 A Responsive Bidder means a person or entity that has submitted a Bid which conforms in all material respects to the Invitation to Bid and requirements of the Bidding Documents.

§ 1.12 An informality means a minor defect or variation of a Bid from the exact requirements of the Invitation to Bid and of the Bidding Documents which does not affect the price, quality, quantity or delivery schedule for the goods, services or construction being procured.

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.7The Bidder has carefully reviewed the Bidding Documents and has verified that all of the Bidding Documents received are complete. The Bidder shall notify the Architect immediately if received Bidding Documents are not complete.

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.8The Bidder has familiarized itself with all applicable federal, state and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work; the Bidder has obtained the necessary licenses for bidding, if applicable, and is licensed or certified to perform the Work.

.9The Bidder shall pay all county, city, state and federal taxes required by laws in effect at the time the Bids are received and resulting from the Work or traceable thereto. Said taxes shall not be in addition to the Contract price between the Owner and the Bidder, as the taxes shall be an obligation of the Bidder and not of the Owner, and the Owner shall be held harmless and indemnified for the same by the Bidder.

.10The failure or omission of any Bidder to receive or examine any form, instrument, addendum or other documents, or to acquaint itself with conditions existing at the site(s), shall in no way relieve any Bidder from any obligations with respect to its Bid or to the Contract.

.11The Bidder agrees that its Bid shall be based on products and work indicated in the Bidding Documents.

§ 3.1.3 2.1 When the 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~~are returned by the Bidders to the Architect or Owner, the shipping or postage shall be prepaid by the Bidder. The Bidder's deposit will not be refunded if the deposit sum is non-refundable as indicated in the Advertisement or Invitation to Bid.

§ 3.1.4.1 Every Bidder is responsible to review all Bidding Documents received to verify that each set contains a complete set of Contract Documents. Any incomplete Bidding Documents shall be immediately returned to the Architect.

PAGE 4:

§ 3.4.3.1 Depending on the nature of an Addendum (clarifications, limited scope of revisions, added manufacturers) issued less than four days prior to receipt date, the Architect, in its professional judgment, reserves the right to issue said Addendum without postponement of the bid date. However, if in the professional judgment of the Architect, the information contained in the Addendum would be such that it would be unfair or unreasonable to prepare a bid proposal based on the revisions in the Addendum, then the bid date will be postponed to allow distribution of the Addendum and time to prepare a bid proposal.

§ 3.3.1.1 The Bidder assumes all risks using a price or bid proposal representing a product or Work that is not indicated in the Bidding Documents and, if the Bidder elects to use that product or Work he shall submit it in accordance with the Division 1 requirements, and as stated herein. If that product or Work is rejected, the Bidder shall provide a product or Work indicated in the Bidding Documents at its cost. The Architect and the Owner shall not consider any requests for additional payments to provide the Work as required by the Contract Documents.

§ 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 DELETE THIS PROVISION. MAINTAIN ONLY IF A SUBSTITUTION FORM IS NOT INCLUDED IN THE SPECS 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.

Copies of the Addendum will be posted electronically and a notice of posting will be sent via facsimile/email to each plan holder of record.

PAGE 5:

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§ 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~~ Where so indicated by the bid form, all amounts shall be expressed in figures only.

§ 4.1.4 ~~Edits to entries~~ All changes made ~~on paper bid forms must be~~by the Bidder to the bid form or outside of the envelope shall be signed or initialed by the ~~signer of the Bid.~~Bidder. Bids containing any conditions, omissions, erasures, alterations, or items not called for in the Bid, may be rejected by the Owner as being incomplete or nonresponsive.

§ 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. If the Bidder does not desire to bid on an Alternate, enter the words "No Bid". If the Owner elects to accept an Alternate, all Bidders submitting a "No Bid" for the Alternate selected by the Owner will be ruled nonresponsive and their Bid will not be considered in the award of the Contract. If the Bidder does not enter an Alternate Bid amount, "No Change", or 'No Bid" for all requested Alternates, and leaves the Alternate information blank, their Bid will be considered nonresponsive and will not be considered in the award of the Contract.

§ 4.2.1 Each Bid shall be accompanied by bid security in the ~~following bid security:~~form of either a cashier's or certified check or an acceptable Bid Bond in the amount of five percent (5%) of the Bid amount, and made payable to the Town of South Hill, Virginia . The bid security is a guarantee that if the Contract is awarded by the Owner to the Bidder, the Bidder shall enter into the Contract with the Owner for the Work mentioned in this Bid or forfeit the bid security to the Owner, not as a penalty, but as liquidated damages. No forfeiture under a bid security shall exceed the lesser of (i) the difference between the Bid for which the bid security was written and the next low Bid of another Bidder, or (ii) the face amount of the bid security.

§ 4.2.2 All bonds shall be executed by a surety company selected by the Bidder which is legally authorized to do business in the Commonwealth of Virginia], and the bond shall be the same in both form as well as substance as AIA Document A310, Bid Bond. The Bidder shall require the attorney-in-fact, who executed the required bond on behalf of the surety company, to affix thereto a certified and current copy of the power of attorney. The bond premium shall be paid by the Bidder and the cost shall be included in the Bid.

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§ 4.3.7 Trade secrets or proprietary information submitted by a Bidder in connection with a procurement transaction, shall not be subject to public disclosure under the Freedom of Information Act; however, the Bidder must invoke the applicable protection, prior to or upon submission of the data or other materials, and must identify the data or other materials to be protected and state the reasons why protection is necessary. The Owner will not accept responses to the Invitation to Bid in cases where the Bidder declares the entire response to the Invitation to Bid to be proprietary information. The Bidder must designate, in the smallest increments possible, that part of the Bid which is deemed to be proprietary.

§ 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~~beginningdays after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3.1.1 All public contracts with nongovernmental contractors for the purchase or lease of goods, or for the purchase of services, insurance, or construction, shall be awarded after competitive sealed bidding, or competitive negotiation as provided in Virginia Code §2.2-4303, unless otherwise authorized by law. All state public bodies accepting bids or proposals for contracts pursuant to The Virginia Public Procurement Act, Virginia Code §2.2-4300 et seq., shall provide an option to submit bids or proposals through the Commonwealth's statewide electronic procurement system, known as eVA. The Director of the Department of General Services, or his designee, may grant an exemption from such requirement at the request of a state public body and upon a showing of good cause. All local public bodies shall provide an option to submit bids or proposals through eVA or other electronic means. In cases where bids or proposals are submitted electronically, the local public body may also require a certain number of paper submissions for review purposes.

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§ 4.3.2.1 The Bidder shall place on the outside of the envelope containing its Bid the following notation: "Contractor License Number and Class of License."

§ 4.3.6 In the solicitation or awarding of Contracts, the Owner shall not discriminate because of the race, religion, color, sex, age, disability or national origin of the Bidder. The Owner welcomes and encourages the participation of small businesses and businesses owned by women and minorities in procurement transactions made by the Owner.

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§ 4.4.1 ~~Prior to the date and time~~A Bid may not be modified, withdrawn or canceled by the Bidder after the time and date designated for the 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~~and for sixty-one (61) calendar days thereafter except as provided in subparagraph 4.4.3 of these Instructions to Bidders and each Bidder so agrees in submitting a Bid.

§ 4.4.1.1 A Bid may be modified or withdrawn by the Bidder any time prior to the time and date set for the receipt of Bids. The Bidder shall notify the Owner in writing of its intentions. Such notice shall be in writing over the signature of the person who submitted the original Bid and the notice shall be received and date and time stamped by the Owner on or before the date and time set for the receipt of Bids.

§ 4.4.1.2 Bidders may indicate modifications to Bid amounts by writing the modification on the outside of the sealed envelope containing the Bid and initialing the modification. Only the Bid amount may be modified by this means; no other qualifications may be made.

§ 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:~~A Bidder may withdraw its Bid from consideration if the Bid price was substantially lower than other Bids due solely to a mistake therein, provided the Bid was submitted in good faith, and the mistake was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of Work, labor made directly in the compilation of a Bid which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the Bid sought to be withdrawn. If a Bid contains both clerical and judgment mistakes, a Bidder may withdraw its Bid from consideration if the Bid would have been substantially lower than the other Bids due solely to the clerical mistake, that was an unintentional arithmetic error or an unintentional omission of a quantity of Work, labor or material made directly in the compilation of a Bid which shall be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the Bid sought to be withdrawn.

§ 4.4.3.1 The Bidder shall submit to the Owner its original work papers, documents and materials used in the preparation of the Bid within one (1) day after the date fixed for submission of Bids. Such work papers shall be delivered to the Owner by the Bidder in person or by registered mail at or prior to the time fixed by the Owner for the opening of Bids. The Contract shall not be awarded by the Owner until such period has elapsed. Such mistake shall be proved only from the original work papers, documents, and materials delivered to the Owner as required herein.

§ 4.4.3.2 No Bidder who is permitted to withdraw a Bid shall for compensation, supply any material or labor to or perform any subcontract or other work agreement for the person or firm to whom the Contract is awarded or otherwise benefit directly or indirectly from the performance of the Work for which the withdrawn Bid was submitted.

§ 4.4.3.3 If a Bid is withdrawn under authority of this section, the next lowest responsive and responsible Bidder shall be deemed to be the low Bidder.

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~~(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)~~

§ 4.4.3.4 When the procedure set forth in the paragraphs above is utilized, original work papers, documents, and materials used in the preparation of the Bid must be submitted in an envelope or package separate and apart from the envelope containing the Bid marked clearly as to the contents.

§ 4.4.3.5 If the Owner denies the withdrawal of a Bid under the provisions of this section, it shall notify the Bidder in writing stating the reasons for its decision and award the Contract to such Bidder at the Bid price, provided such Bidder is a responsible and responsive Bidder.

~~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.~~All Bids received on time in accordance with the Bidding Document requirements shall be opened and publicly read aloud. Any Bidder, upon request, shall be afforded the opportunity to inspect Bid records within a reasonable time after the opening of all Bids but prior to award, except in the event that the public body decides not to accept any of the Bids and to reopen the Contract. Otherwise, Bid records shall be open to public inspection only after award of the Contract. Any inspection of procurement transaction records shall be subject to reasonable restriction to ensure the security and integrity of the records.

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or not in conformance with requirements of the Bidding Documents is subject to rejection.

§ 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~~ and does not exceed the funds available. 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~~Owner's judgment, is in the ~~Owner's~~Owner's own best interests.

§ 5.3.1.1 In determining the lowest responsible Bidder, the Owner may consider, among other things, the Bidder's past performance, conduct on other contracts, and other information provided by the Bidder, including in the Contractor's Pre-Qualification Package, if requested.

§ 5.3.3 In case of a tie Bid, preference may be given to goods, services, and construction produced in Mecklenburg County or the Commonwealth of Virginia or provided by persons, firms or corporations having principal places of business in Mecklenburg County or the Commonwealth of Virginia , if such a choice is available; otherwise the tie shall be decided by lot. A Mecklenburg County business may be given preference over a Commonwealth of Virginia business, if such a choice is available.

§ 5.3.4 If a Contract is to be awarded, the Owner will give the Bidder a Notice of Award within sixty (60) calendar days after the day of the Bid opening.

§ 5.4 NEGOTIATION WITH LOWEST RESPONSIVE AND RESPONSIBLE BIDDER

§ 5.4.1 If award of a Contract to the lowest responsive and responsible Bidder is precluded because of limitations on available funds, the Owner reserves the right to negotiate the Bid amount with the lowest responsive, responsible Bidder to obtain a Contract amount within the available funds. The negotiations may involve changes in either the features or scope of the Work. Such negotiations may include reducing the quantity, quality, or other cost saving mechanisms involving items in the Bid amount, including unit prices (if any) and/or allowances (if any) that affect the Bid amount, and/or Alternates (if any).

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§ 5.4.2 The Owner shall notify the lowest responsive and responsible Bidder that such a situation exists and the Owner and Bidder shall then conduct their negotiations in person, by mail, by telephone or by any means they find convenient.

§ 5.4.3 If an acceptable Contract can be negotiated, the changes to the Bid amount and Bidding Documents agreed upon in the negotiations shall be summarized in a "Post Bid Addendum," and included in the Contract.

§ 5.4.4 If the Owner and the lowest responsive and responsible Bidder cannot negotiate a Contract within available funds, the Owner shall terminate negotiations and reject all bids.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing 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~~Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity~~. The Bidder may also submit any required~~ with an adjustment in the Base Bid or Alternate Bid to ~~account for~~cover the difference in cost occasioned by such substitution, provided such adjustment in cost is justifiable and reasonable. 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~~has 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~~.

§ 7.1.1 ~~If stipulated in the Bidding Documents, the~~The successful Bidder shall furnish ~~bonds~~a Performance Bond covering the faithful performance of the Contract and a Payment Bond covering the 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~~ Each bond shall be written for the full value of the Contract, including all adjustments as authorized by Change Order.

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§ 7.1.2 All bonds shall be written by sureties or insurance companies licensed to do business in the Commonwealth of Virginia.

§ 7.1.3 The ~~Bidder~~bond premiums shall ~~provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located~~be paid by the successful Bidder and the cost shall be included in the Bid price. Any subsequent bond premium costs shall be as authorized by Change Order.

§ 7.2.1 The successful 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.~~along with the signed Contract (Agreement) forms and the required Certificate of Insurance to the Owner within fifteen (15) calendar days after the Notice of Award of the Contract.

§ 7.2.2 ~~Unless otherwise provided, the~~The bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Each bond shall be written for the full amount of the Contract.

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

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

ARTICLE 8 ~~ENUMERATION~~FORM OF ~~THE PROPOSED CONTRACT DOCUMENTS~~AGREEMENT BETWEEN OWNER AND CONTRACTOR

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§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1AIA Document A101™–2017Unless otherwise required in the Bidding Documents, the Contract for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.

(Insert Where the complete AIA Document number, including year, and Document title.)Basis of Payment Is a Stipulated Sum.

§ 8.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

.3AIA 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 Building Information Modeling Exhibit, if completed:

.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:

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~~(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.)~~ The Contractor recognize that time is of the essence and that the Owner will suffer financial loss if the Work is not completed by the Substantial Completion date required or as may be amended by the Contract Documents. Contractor recognizes the delays, expenses and damages that are involved in proving in a legal proceeding the actual loss that may be suffered by the Owner if the Work is not completed on time. Accordingly, the Owner and the Contractor agree, stipulate and fix as liquidated damages if delayed, but not as a penalty, the sum indicated on the Bid Form that the Contractor together with the Contractor's surety shall pay the Owner for each calendar day or part thereof that expires after the date required or as may be amended by the Contract Documents for the Substantial Completion of the Work.

§ 8.3 The Contractor recognizes that time is of the essence and that the Owner will suffer financial loss if the Work is not completed by the Final Completion date required or as may be amended by the Contract Documents. The Contractor recognizes the delays, expenses and damages that are involved in proving in a legal proceeding the actual loss that may be suffered by the Owner if the Work is not completed on time. Accordingly, the Owner and the Contractor agree, stipulate and fix as liquidated damages if delayed, but not as a penalty, the sum indicated on the Bid Form that the Contractor together with the Contractor's surety shall pay the Owner for each calendar day or part thereof that expires after the date indicated required or as may be amended by the Contract Documents for the Final Completion of the Work.

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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 11:26:20 EDT on 10/09/2026 under Order No. 20250092556 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)

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BID FORM
SOUTH HILL NEW POLICE STATION
BID REQUEST NO.: 2026-11

DATE: _____

TO: TOWN OF SOUTH HILL, VA
ATTN: KELI REEKES
211 S. MECKLENBURG AVE, SOUTH HILL, VA 23970

FROM: _____
Bidder's Name

_____
Bidder's Address

_____
Bidder's Address

FOR: SOUTH HILL NEW POLICE STATION

Having carefully examined the site, and all of the Bidding and Contract Documents, and in compliance with the "Invitation to Bid" and "Instructions to Bidders," the undersigned proposes to provide all labor, materials, supplies, equipment, services, and perform all Work necessary for the construction of this Project in accordance with the Bid Documents, dated October 21st, 2026, prepared by Moseley Inc.

Complete this Bid Form in blue or black ink or by computer. Discrepancies in the multiplications of units of work and the unit prices will be resolved in favor of the correct multiplication of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

PART A: BASE BID PRICE:

The Base Bid Price includes all Work required by and in strict accordance with the Bid Documents for this Project, for the Lump Sum of:

$_____(Figures only).

PART B: LUMP SUM ALLOWANCES: (Reference Section 012100 – Allowances)

1. Allowance No. 1: Interior Signage: $6,300.00
2. Allowance No. 2: Electrical Circuit Revisions: $20,000.00
3. Allowance No. 3: Cameras: $22,509.94
4. Allowance No. 4: Access Control: $36,475.00
5. Allowance No. 5: Hazardous Materials Abatement: $50,000.00

PART C: QUANTITY ALLOWANCES: (Reference Sections 012100 – Allowances and 012200 – Unit Prices)

1. Quantity Allowance No. 1: Moisture Vapor Treatment; furnish and install:

   Estimated quantity of 8,086 s.f. at $_____ per s.f. (in-place unit price/measure) =

   $_____ (Figures only).

2. Quantity Allowance No. 2: Additional Excavation, off-site disposal and backfill:

   Estimated quantity of 500 c.y. at $_____ per c.y. (in-place unit price/measure) =

   $_____ (Figures only).

3. Quantity Allowance No. 3: Additional Excavation in Trenches and Footings, off-site disposal and backfill:

   Estimated quantity of 15 c.y. at $_____ per c.y. (in-place unit price/measure) =

   $_____ (Figures only).

4. Quantity Allowance No. 4: Building Undercut, additional undercut beyond Geotechnical requirements:

   Estimated quantity of 50 c.y. at $_____ per c.y. (in-place unit price/measure) =

   $_____ (Figures only).

5. Quantity Allowance No. 5: Rock Excavation in Trenches and Footings, off-site disposal and backfill:

   Estimated quantity of 15 c.y. at $_____ per c.y. (in-place unit price/measure) =

   $_____ (Figures only)

6. Quantity Allowance No. 6: Additional Crushed stone (VDOT #1, #3, and/or #7)

   Estimated quantity of 500 tons. at $_____ per ton. (in-place unit price/measure) =

   $_____ (Figures only)

7. Quantity Allowance No. 7: Subsurface drains, trench, install, and backfill:

   Estimated quantity of 1,000 l.f. at $_____ per l.f. (in-place unit price/measure) =

   $_____ (Figures only)

8. Quantity Allowance No. 8: Brick Replacement:

   Estimated quantity of 300 s.f. at $_____ per s.f. (in-place unit price/measure) =

   $_____ (Figures only)

9. Quantity Allowance No. 9: Mortar Repointing:

   Estimated quantity of 300 s.f. at $_____ per s.f. (in-place unit price/measure) =

   $_____ (Figures only)

10. Quantity Allowance No. 10: Self-Leveling Underlayment:

    Estimated quantity of 100 bags at $_____ per bag of leveler =

    $_____ (Figures only)

TOTAL BASE BID PRICE – the Apparent Low Bidder shall be determined based on this price (inclusive of Part A Base Bid Price + all Part B Lump Sum Allowances + all Part C Quantity Allowances) =

$_____ Figures only.

RECEIPT OF ADDENDA

We acknowledge the receipt of the following Addenda:

Addendum No. _____, dated _____
Addendum No. _____, dated _____
Addendum No. _____, dated _____
Addendum No. _____, dated _____

TIME OF COMPLETION

Based upon a Notice to Proceed within sixty-five (65) calendar days from the opening of the bid, Work included in this Contract shall be Substantially Complete no later than 365 days after Notice to Proceed and finally complete no later than thirty-two (32) calendar days thereafter.

LIQUIDATED DAMAGES

Liquidated Damages (Refer to Supplemental Conditions): $500 per calendar day for failure to achieve the approved Substantial Completion Date.

REGISTRATION

The Undersigned is a licensed Class A Contractor in accordance with applicable state statutes and regulations, as amended, Certificate No. _____, dated ____/____/____. A Class A Contractor License is required for this project.

Indicate whether your business ____is or ____is not located in MECKLENBURG / SOUTH HILL, VA and whether you _____ have or ____ have not obtained a MECKLENBURG / SOUTH HILL license to conduct or engage in this business, trade, or occupation in MECKLENBURG / SOUTH HILL, VA.

A bid by a corporation shall further give the State of incorporation _____, State Corporation Commission ID number _____, and have the corporate seal affixed in the space provided herein.

CERTIFICATION

I certify that the firm name given below is the true and complete name of the Bidder and that the Bidder is legally qualified and licensed, to perform all Work included in the scope of the Contract.

Legal Name of Bidder (Company) _____

Bidder's (Company) Address _____

Corporate
Seal

Signature _____
(Signature of person(s) legally authorized to bind Bidder (Company) to this Contract)

By: _____
(Typed or printed Name(s) of Person(s) Signing)

Title: _____
(Typed or printed Title(s) of Person(s) Signing)

Telephone Number: _____ E-mail: _____
(include Area Code) (of person indicated above)

(This form may be reproduced in exact detail)

END OF BID FORM

AIA® Document A310™ – 2010

Bid Bond

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

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CONTRACTOR:
(Name, legal status and address)
To be determined

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

OWNER:
(Name, legal status and address)
Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

BOND AMOUNT: $

PROJECT:
(Name, location or address, and Project number, if any)
South Hill New Police Station

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

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

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

Signed and sealed this day of ,

CONTRACTOR AS PRINCIPAL *(Signature)*	**SURETY** *(Signature)*
BY:	BY:
(Printed name and title)	*(Printed name and title)*

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Witness Signature	Witness Signature
(Witness)	*(Witness)*

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PAGE 1:

~~CONTRACTOR:~~

~~(Name, legal status and address)~~

~~SURETY:~~

~~(Name, legal status and principal place of business)~~

PAGE 2:

CONTRACTOR:

SURETY:

(Name, legal status and address)

(Name, legal status and principal place of business)

To be determined

Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

-

South Hill New Police Station

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_____

(Signed)

_____

(Title)

_____

(Dated)

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AIA® Document A305® – 2020

Contractor's Qualification Statement

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

SUBMITTED BY:
(Organization name and address.)

SUBMITTED TO:
(Organization name and address.)

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

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

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

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

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

_____ _____
Organization's Authorized Representative Signature **Date**

_____
Printed Name and Title

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

_____
Notary Signature

My commission expires:

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_____

(Signed)

_____

(Title)

_____

(Dated)

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AIA® Document A305® – 2020 Exhibit A

General Information

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

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

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

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

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

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

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

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

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

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

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

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

§ A.1.3 Other Information

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

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

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

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

§ A.2 EXPERIENCE

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

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

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

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

§ A.3 CAPABILITIES

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

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

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

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

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

§ A.4 REFERENCES

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

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

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

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

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AIA® Document A305® – 2020 Exhibit B

Financial and Performance Information

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

§ B.1 FINANCIAL

§ B.1.1 Federal tax identification number:

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

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

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

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

§ B.2 DISPUTES AND DISCIPLINARY ACTIONS

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

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

.1 failed to complete work awarded to it?

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

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

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

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

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

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

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

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AIA® Document A305® – 2020 Exhibit C

Project Specific Information

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

PROJECT:
(Name and location or address.)

South Hill New Police Station

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

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

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

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

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

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

§ C.1.4 Identify key personnel from your organization who will be meaningfully involved with work on this Project and indicate (1) their position on the Project team, (2) their office location, (3) their expertise and experience, and (4) projects similar to the Project on which they have worked.

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

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

§ C.2 EXPERIENCE RELATED TO THE PROJECT

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

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

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

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

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

§ C.3 SAFETY PROGRAM AND RECORD

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

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

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

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

§ C.4 INSURANCE

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

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

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

§ C.5 SURETY

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

§ C.5.2 Surety company name:

§ C.5.3 Surety agent name and contact information:

§ C.5.4 Total bonding capacity:

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

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PAGE 1:

South Hill New Police Station

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AIA® Document A305® – 2020 Exhibit D

Contractor's Past Project Experience

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

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AIA® Document A305® – 2020 Exhibit E

Contractor's Past Project Experience, Continued

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

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AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor *where the basis of payment is a Stipulated Sum*

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

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

Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

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

To be determined

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

South Hill New Police Station

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

Moseley Inc.
3200 Norfolk Street
Richmond, VA 23230

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes 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 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.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

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§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

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§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

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.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

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ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

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§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds
§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

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

.5 Drawings

Number	Title	Date

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.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

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

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

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
BY:	BY:

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(Printed name and title)	*(Printed name and title)*

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Additions and Deletions Report for
AIA® Document A101® – 2017

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 11:47:12 EDT on 10/09/2026.

PAGE 1:

Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

To be determined

South Hill New Police Station

Moseley Inc.
3200 Norfolk Street
Richmond, VA 23230

PAGE 7:

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with ~~a building information modeling exhibit~~AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with ~~a building information modeling exhibit~~AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

.4AIA Document E203™–2013, Building ~~information modeling exhibit~~Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the ~~building information modeling exhibit~~E203-2013 incorporated into this Agreement.)

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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 11:47:12 EDT on 10/09/2026 under Order No. 20250092556 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A101™ - 2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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SECTION 005213.01
FORM OF AGREEMENT EXHIBIT A – INSURANCE & BOND REQUIREMENTS

ARTICLE 1 CONTRACTOR'S INSURANCE & BONDS

1.01 GENERAL

A. Contractor shall provide and maintain insurance and bond coverages per the requirements herein, and in accordance with requirements of Article 11 of AIA Document A201. In the event of overlap or conflict, the A201 shall govern.

B. The Contractor shall provide a summary of insurance coverages on an ACORD 25 Certificate of Insurance (COI) or other industry standard form of certificate.

C. The Contractor shall ensure that all required insurance policies and coverages are verified and in-place prior to issuance of Notice to Proceed.

D. Form of Bond for Payment and Performance Bonds: Document AIA A312; sample form of bond is included in the Bidding and Procurement documents.

E. All insurance and bond coverage shall be provided through a company or companies with an "A" or better rating, and licensed in the state where the Project is located.

F. All General Liability, Automobile, and Umbrella insurance shall designate the Owner, Architect, and Architect's consultants as additional insureds.

G. General Liability shall not exclude explosion (X), collapse (C), or underground (U) coverages.

H. Automobile Liability shall include coverage for Owned, Non-Owned, and Hired autos.

I. The Contractor shall maintain Completed Operations coverage for two (2) years from the date of Substantial Completion.

1.02 INSURANCE COVERAGE LIMITS

A. The Contractor shall provide the following minimum coverages:
   1. Comprehensive General Liability:
      a. $1,000,000 – Each Occurrence.
      b. $500,000 – Damage to Rented Premises.
      c. $10,000 – Medical Expense (Any One Person).
      d. $1,000,000 – Personal and Advertising Injury.
      e. $2,000,000 – General Aggregate.
      f. $2,000,000 – Products and Completed Operations Aggregate Limit.
      g. $100,000 – Fire Damage.
   2. Comprehensive Business Automobile Liability:
      a. $1,000,000 – Each Occurrence.
   3. Worker's Compensation: Per statutory limits of the state where the project is located.
   4. Employer Liability for Participants not covered by Worker's Compensation:
      a. $100,000 – Employer Liability – Each Accident.
      b. $100,000 – Employer Liability – Disease – Each Employee.
      c. $500,000 – Employer Liability – Disease – Policy Limit.
   5. Umbrella Coverage:
      a. $1,000,000 - Each Occurrence.
      b. $5,000,000 - Aggregate.

6. Builder's Risk:
    a. New Construction (including Additions): The Contractor shall insure 100% of the original Contract amount.
    b. Renovations: For renovation of existing structures, the Owner shall provide and maintain Builder's Risk insurance on the existing facility, with the Contractor being responsible for the first $10,000 of any claim.
7. Pollution:
    a. $1,000,000 - Each Occurrence.
    b. $2,000,000 - Aggregate.

1.03 BONDS

A. The Contractor shall provide the following:
    1. Performance Bond: 100 percent of the Contract Sum.
    2. Payment Bond: 100 percent of the Contract Sum.

END OF EXHIBIT A – INSURANCE AND BOND REQUIREMENTS

AIA® Document A312® – 2010

Payment Bond

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

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

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CONTRACTOR:
(Name, legal status and address)
To be determined

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

OWNER:
(Name, legal status and address)
Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
(Name and location)
South Hill New Police Station

BOND
Date:
(Not earlier than Construction Contract Date)
Amount: $

Modifications to this Bond:		None		See Section 18

Company: (Corporate Seal)

Company: (Corporate Seal)

CONTRACTOR AS PRINCIPAL *(Signature)*

BY:

(Printed name and title)

SURETY *(Signature)*

BY:

(Printed name and title)

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

(FOR INFORMATION ONLY — Name, address and telephone)
AGENT or **BROKER:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor

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in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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

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

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

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

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

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

§ 16 Definitions

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

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

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

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and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

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

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

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

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

§ 18 Modifications to this bond are as follows:

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

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

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PAGE 1:

~~CONTRACTOR:~~

~~(Name, legal status and address)~~

~~SURETY:~~

~~(Name, legal status and principal place of business)~~

~~OWNER:~~

~~(Name, legal status and address)~~

PAGE 2:

~~CONSTRUCTION CONTRACT~~

~~Date:~~

~~Amount: $~~

~~Description~~CONTRACTOR:

SURETY:

(Name, legal status and principal place of business)

(Name, legal status and ~~location~~address)

To be determined

OWNER:

(Name, legal status and address)

Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

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-

CONSTRUCTION CONTRACT

Date:

Amount: $ 0.00

Description:

(Name and location)

South Hill New Police Station

PAGE 5:

CONTRACTOR AS PRINCIPAL

SURETY

Company:

(Corporate Seal)

Company:

(Corporate Seal)

Signature:

Signature:

Name and Title:

Name and Title:

Address:

Address:

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_____

(Signed)

_____

(Title)

_____

(Dated)

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AIA® Document A312® – 2010

Performance Bond

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

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

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CONTRACTOR:
(Name, legal status and address)
To be determined

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

OWNER:
(Name, legal status and address)
Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

CONSTRUCTION CONTRACT
Date:
Amount: $ 0.00
Description:
(Name and location)
South Hill New Police Station

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $

Modifications to this Bond:		None		See Section 16

Company: (Corporate Seal)

Company: (Corporate Seal)

CONTRACTOR AS PRINCIPAL *(Signature)*

SURETY *(Signature)*

BY:

BY:

(Printed name and title)

(Printed name and title)

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

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

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

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

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

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

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

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

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

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

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

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

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

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the

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payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

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

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

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

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

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

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

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

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

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

§ 14 Definitions

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

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

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

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

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

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

§ 16 Modifications to this bond are as follows:

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

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

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PAGE 1:

~~CONTRACTOR:~~

~~(Name, legal status and address)~~

~~SURETY:~~

~~(Name, legal status and principal place of business)~~

~~OWNER:~~

~~(Name, legal status and address)~~

PAGE 2:

~~CONSTRUCTION CONTRACT~~

~~Date:~~

~~Amount: $~~

~~Description~~CONTRACTOR:

SURETY:

(Name, legal status and principal place of business)

(Name, legal status and ~~location~~address)

To be determined

~~BOND~~OWNER:

(Name, legal status and address)

~~Date:~~

~~(Not earlier than Construction Contract Date)~~

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Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

-

~~Amount: $~~

~~Modifications to this Bond:~~

~~None~~

~~See Section 16~~

CONSTRUCTION CONTRACT

Date:

Amount: $ 0.00

Description:

(Name and location)

South Hill New Police Station

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: $

Modifications to this Bond:

None

See Section 16

PAGE 6:

CONTRACTOR AS PRINCIPAL

SURETY

Company:

(Corporate Seal)

Company:

(Corporate Seal)

Signature:

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Address:

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_____

(Signed)

_____

(Title)

_____

(Dated)

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AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

South Hill New Police Station

THE OWNER:
(Name, legal status and address)

Town of South Hill, Virginia
211 S. Mecklenburg Avenue
South Hill, VA 23970

THE ARCHITECT:
(Name, legal status and address)

Moseley Inc.
3200 Norfolk Street
Richmond, VA 23230

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Project Manual and Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

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§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. Notwithstanding such performance, in case of a conflict, disagreement, or ambiguity, provide the better quality of Work. In case of a conflict, disagreement, or ambiguity, provide the greater quantity of Work.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

1.2.1.2 Plumbing, Mechanical, Fire Protection and Electrical drawings are diagrammatic, showing general locations and arrangements of piping, wiring, equipment, security and technology, and specialties; not necessarily showing all required offsets, conditions and appurtenances required for maximum practical accessibility for operation, maintenance and clearances. Coordinate this Work in order to achieve the required and intended Work and notify the Architect immediately of conditions which do not comply or will not allow for this condition.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 Unless otherwise required by the Owner and Architect Agreement, the Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7, 1.8, and 1.9 solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to

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whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery, including signature of receiver of such notices.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties shall use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data, should such Exhibit be included in the Agreement.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

§ 1.9 If such Exhibits are not included in the Agreement, the Architect may, with the concurrence of the Owner, furnish to the Contractor versions of the Instruments of Service in electronic form. The Contract Documents executed or identified in accordance with Section 1.1.1 shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers. The Contractor shall not transfer or reuse Instruments of Service in electronic or machine readable form without the prior written consent of the Architect.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. The Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor

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may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one electronic copy of the Drawings, Specifications, and Addenda issued, for the purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.6.1 At the Architect's sole discretion, selected electronic (CAD) Drawing files may be made available for use by the Contractor after execution of the Contract for Construction, with the exception of civil grading and layout plans, if authorized by the civil consultant. Such electronic files are not part of the Contract Documents. If available, the Architect shall release them to the Contractor subject to the terms and conditions established by the Architect, to which the Contractor must agree without exception prior to release of the electronic files. Refer to www.moseleyarchitects.com for the Architect's current Request for Electronic (CAD) Files form, which defines the applicable terms and conditions.

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§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Amounts charged to the Contractor may, pursuant to Section 9.5.1, nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.4 During the performance of this Contract, the Contractor will include the provisions of the foregoing Sections 3.1.4.1 and 3.1.4.2 in every Subcontract or purchase order of over ten thousand dollars ($10,000.), so that the provisions will be binding upon each Subcontractor or vendor; and furthermore, the Contractor agrees as follows:

.1 The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin, except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.

.2 The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal opportunity employer.

.3 Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting requirements of this section.

.4 The Contractor does not, and shall not during the performance of this Contract, knowingly employ an unauthorized alien as defined in the Federal Immigration Reform and Control Act of 1986.

.5 Contractor hereby represents it is organized as a stock or non-stock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership and is authorized to transact business in the jurisdiction where the Project is located as a domestic or foreign business entity if so required by Title 13.1 or Title 50 or as otherwise required by law.

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§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.5 The Owner shall deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's requests for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior correspondence or documentation.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be appropriate, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative in writing, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

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§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work found to be acceptable by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after review by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.2.1 After the Contract has been executed, the Owner and the Architect will consider a formal request for substitution in lieu of those required by the Contract Documents only under and in addition to, the conditions set forth in the Contract Documents. By making requests for substitutions, the Contractor:

.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to requirements of the Contract Documents;

.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor is required to provide under the Contract Documents;

.3 certifies that the cost data presented is complete and includes all related costs under this Contract including the Architect's redesign costs, and waives all claims for additional costs and time related to the substitution which subsequently become apparent; and

.4 will coordinate and perform the installation of the accepted substitute, making such changes to the Work as may be required for the Work to be complete in all respects.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Owner shall deduct from the Contract Sum amounts paid to the Architect for the Architect to review the Contractor's proposed substitutions, to make agreed-upon changes in the Instruments of Service, including the Contract Documents, and to provide additional construction phase services made necessary by the Owner's acceptance of such substitutions.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

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§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.1 The 179D tax deduction incentivizes building owners and designers for designing energy-efficient building systems, including lighting, HVAC, and building envelope components. Since government entities do not pay taxes, this deduction is not available to the Owner. Current tax code allows for this deduction to be allocated to the Architect by the Owner on eligible projects to help incentivize energy-efficient building design.

§ 3.6.2 The Contractor recognizes that the Architect is the only entity eligible to pursue such allocations in accordance with 26 U.S. Code §179D, which reads in part, "The allocation of the deduction [is] to the person primarily responsible for designing the property in lieu of the owner of such property." The Contractor further acknowledges the Architect as the primary designer of the project for the purposes of 179D and agrees not to pursue the deduction or to request any portion thereof from the Architect or Owner.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.1.1 Unless otherwise provided in the Contract Documents, the Contractor is responsible for obtaining utilities for the Project and providing the Work relating to Project utilities as indicated. Responsibility for payment of fees associated with providing utilities to the Project shall be as follows:

.1 Any fees assessed by entities for providing permanent utilities to the Project shall be paid directly to the utility entities by Owner. These include "tap fees" and "electrical connection and service fee." Contractor shall coordinate the permanent utilities and the entity's related work to comply with the construction schedule.

.2 Any fees assessed by entities for providing temporary utilities to the Project for use by Contractor during construction of the Project shall be paid by the Contractor. The Contractor's payment of fees for temporary utilities shall be included in the Base Bid and Contract Sum and will not be reimbursed by the Owner.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly review such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will determine that an equitable adjustment should be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination that party may submit a Claim as provided in Article 15.

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§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness. The Contractor shall identify the date for Owner's selection on the critical path of the Contractor's Construction Schedule and provide the Owner a minimum of two weeks notice before this date.

§ 3.9 Superintendent and Project Manager

§ 3.9.1 The Contractor shall employ a competent superintendent and project manager and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent and project manager shall represent the Contractor, and communications given to the superintendent or project manager shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent and project manager. Within 14 days of receipt of the information, the Owner may notify the Contractor, stating whether the Owner (1) has reasonable objection to the proposed superintendent or project manager or (2) requires additional time for review. Failure of the Owner to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent or project manager to whom the Owner has made reasonable and timely objection. The Contractor shall not change the superintendent or project manager without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.9.4 The Superintendent employed by the Contractor shall have a minimum of five (5) years commercial experience as the primary Superintendent on projects of similar size and complexity as the Work. The superintendent shall speak fluent English and clearly understand the English language. The Contractor shall submit to the Owner a resume and other supporting documentation showing that the proposed Superintendent is competent and has the minimum work experience required to execute the Work. The Owner reserves the right to request additional supporting documentation regarding the proposed Superintendent's qualifications and to require the Contractor to propose an alternate Superintendent who better meets the requirements contained in this Article, as may reasonably be determined by the Owner. The Contractor shall notify the Architect and Owner in writing of any proposed replacement of the Superintendent. The Contractor shall not replace a competent Superintendent without prior written approval from the

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Owner. The requirements contained in this Article shall apply to any proposed replacement Superintendent, regardless if the proposed tenure is to be temporary or permanent.

§ 3.9.5 The Contractor shall employ a Project Manager to be assigned to the Work. The Project Manager employed by the Contractor shall have a minimum of five (5) years commercial experience as Project Manager on projects of similar size and complexity as the Work. The project manager shall speak fluent English and clearly understand the English language. The Contractor shall submit to the Owner a resume and other supporting documentation showing that the proposed Project Manager is competent and has the minimum work experience required to execute the Work. The Owner reserves the right to request additional supporting documentation regarding the proposed Project Manager's qualifications and to require the Contractor to propose an alternate Project Manager who better meets the requirements contained in this Article, as may reasonably be determined by the Owner. The Contractor shall notify the Architect and Owner in writing of any proposed replacement of the Project Manager. The Contractor shall not replace a competent Project Manager without prior written approval from the Owner. The requirements contained in this Article shall apply to any proposed replacement Project Manager, regardless if the proposed tenure is to be temporary or permanent. The Project Manager shall not act as the Superintendent or replacement for the Superintendent without written approval from the Owner.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. Unless otherwise required by the Contract Documents; the schedule shall contain details appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to the Substantial Completion date and final completion date indicated in the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule in accordance with section 3.12. Unless otherwise required by the Contract Documents, the submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the accepted submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

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§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule accepted by the Architect or, in the absence of an accepted submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been accepted by the Architect.

§ 3.12.8 The Work shall be in accordance with accepted submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's acceptance of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written acceptance to the specific deviation in accordance with 3.12.9 as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's acceptance thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing on a cover letter attached to the original or on the case of a resubmittal, on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to all revisions or deviations other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's acceptance of a resubmission shall not apply to such revisions or deviations.

§ 3.12.10 The Contractor shall not be required (delegated design) to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If such delegated professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will provide all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, licensed in the state where the Project is located, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals

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performed or provided by such design professionals, provided the Owner and Architect have provided to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and take appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittals. The Architect's review of additional resubmittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall to deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

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§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement. Such terms as 'Architect-Engineer,' 'Engineer,' and 'A-E,' if used in these Contract Documents, is intended to mean the Architect and its consultants unless otherwise intended by the context or usage of such terms. Such terms do not mean or include any design professional of the Contractor, Subcontractor, or Owner.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 Subject to the standard of care for applying professional judgment to information used or relied upon, Architect and its Consultants may use and rely upon design elements, technical standards, test results, and all other information ordinarily or customarily furnished or published by others, including, but not limited to, specialty contractors, manufacturers, fabricators, and suppliers.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site as agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in general compliance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.2.1 The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect or request of the Contractor.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and endeavor to report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor,

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and (3) known defects and deficiencies in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and take appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for general conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute acceptance of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's acceptance of a specific item shall not indicate acceptance of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will review and make determinations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations

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and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall submit to the Owner and Architect the persons or entities proposed for each principal portion of the Work (list of proposed subcontractors), including those who are to furnish materials or equipment fabricated to a special design no later than two days prior to the date of the Pre-construction Conference. Include Contractor's License number and Class for each proposed Subcontractor. Within 14 days of receipt of the information, the Owner may notify the Contractor whether the Owner (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Owner to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not

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prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the complete Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors shall similarly make available copies of the complete Contract Documents to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

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§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Owner and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Owner and Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible between the Owner, Separate Contractors, and Contractor.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.1.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.1.1.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order. A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.1.1.2.1 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

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.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.2.

§ 7.1.1.2.2 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.1.1.2.3 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.1.1.2.4 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional opinion, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

7.1.4 If a change in the Work results in an adjustment to the Contract Sum, the adjustment (increase or decrease) shall be based on the following, unless noted otherwise:

.1 Material quantities and unit prices (separated into trades; include sales tax).
.2 Labor costs (raw cost).
.3 Labor burden, applied to labor only, including but not limited to, worker's compensation and public liability, social security tax, old age and unemployment insurance, union welfare fund and fringe benefits. Contractor shall be required to substantiate the labor burden percentage applied to any change in contract amount. Labor burden percentage shall not exceed 30% in any case.
.4 Construction equipment cost.
.5 Overhead and profit combined (on Claims for net increase only), as defined in Section 7.3.11.
.6 Cost of Premiums for Bonds (for Contractor only). Evidence of additional premium for bond shall be submitted with Claim.
.7 Extended Overhead Costs (if applicable) which shall be established by pro-rating the value of supervision, temporary facility, and General Conditions and all other direct and indirect costs of Contractor included in the Contract Sum over the number of days included in the Contract Time.

§ 7.2.1 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth, a reasonable amount. In such case, and also under Section 7.1.1.2.1.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data which shall include, at the Architect's sole discretion,

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a cost breakdown itemized in accordance with the current appropriate Data Book and edition of R. S. Means Company, Inc., or other source of construction industry cost data acceptable to the Architect.

.1 Overhead shall include, but not be limited to, project management, field office personnel including supervision, superintendence, wages of timekeepers, watchmen and clerks, small tools, incidentals, general office expenses, insurance premiums, and all other expenses not included in "costs."

.2 If the net value of the change results in a credit, the credit given shall be the net cost without overhead or profit (for Contractor, Subcontractor, or Sub-subcontractor). The cost as used herein shall include all items of labor, materials, equipment, premiums and bonds.

§ 7.2.2 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.2.3 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.2.4 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

7.3. In Sections 7.2 and 7.2.1, the amount for overhead and profit combined, included in the total cost to the Owner, shall be based on the following schedule:

.1 for the Contractor, for Work performed by the Contractor's own forces, 15 percent of the cost.

.2 for the Contractor, for Work performed by the Contractor's Subcontractors, 5 percent of the amount due the Subcontractors.

.3 for each Subcontractor involved, for Work performed by that Subcontractor's own forces, 15 percent of the cost.

.4 for each Subcontractor involved, for Work performed by the Subcontractor's Sub-subcontractor, 5 percent of the amount due the Sub-subcontractor.

.5 cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.2.

.6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs in the manner prescribed above. Where major cost items are changes to Subcontracts, they shall be itemized also. In no case will a change involving over $500.00 be approved without such itemization.

§ 7.4 Minor Changes in the Work

In the Architect's opinion, Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

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§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine and the Owner approves.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of

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requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.1.1.2.4, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Until final completion, the Owner will pay 95% of the amount due the Contractor on account of progress payments.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.2.1 Contractor shall provide invoices, package slips, or other form of supporting data for materials stored on-site claimed on the progress payment, unless it can be verified through on-site observations. Maintain concise bill of materials and label materials stored on-site for ready identification and verification.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, unless otherwise agreed upon, within seven working days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in general conformance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for general conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment is not a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

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§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.1.1 The Owner may withhold payments to the Contractor notwithstanding the Architect's certification if it is necessary, in the Owner's opinion, to do so to protect the Owner from loss due to any of the reasons set forth in Sections 9.5.1.1 through 9.5.1.7.

9.6.2 Payment of Subcontractors

§ 9.6.2.1 The Contractor shall pay each Subcontractor, no later than seven working days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

9.6.2.2 Within seven (7) working days after receipt of amounts paid to the Contractor by the Owner for Work performed under this Agreement, the Contractor shall do one of the following:

- **a.** Pay each Subcontractor for the proportional share of the total payment received from the Owner attributable to the Work performed by the respective Subcontractor under This Agreement; or

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b. Notify the Owner and Architect, and Subcontractor, in writing, of the Contractor's intention to withhold all or part of the Subcontractor's payment with the reason for nonpayment.

9.6.2.3 The Contractor shall pay interest to each Subcontractor on all amounts owed by the Contractor that remain unpaid after seven (7) days following receipt by the Contractor of payment from the Owner for Work performed by the affected Subcontractor under this Agreement, except for amounts withheld as allowed in Section 9.6.8.1. Unless otherwise provided under the terms of this Agreement, for purposes solely of these prompt payment provisions, interest shall accrue at the rate of one percent (1%) per month.

9.6.2.4 In each Subcontract, the Contractor shall include a provision requiring each Subcontractor to include or otherwise be subject to the same payment and interest requirements with respect to each lower-tier Subcontractor (Sub-Subcontractor).

9.6.2.5 The Contractor's obligation to pay interest to a Subcontractor pursuant to the prompt payment provisions is not an obligation of the Owner, and no modification shall be made to this Agreement and no cost reimbursements claim shall be made for the purpose of providing reimbursement by Owner for such interest charge.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If, unless otherwise agreed upon, the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven working days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven working days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional working days' notice to the Owner and Architect, stop the Work until payment of the amount owing has

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been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can fully occupy or utilize the Work or designated portion thereof, for its intended use with all of the Work's parts and systems operable as required by the Contract Documents. Only incidental cleaning, if required beyond cleaning needed for the Owner's full occupancy or utilization, may remain for final completion.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

9.8.3.1 The Architect will provide no more than one (1) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall deduct from the Contract Sum amounts paid to the Architect for any additional inspections.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly review the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in general compliance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

9.10.1.1 The Architect will provide no more than one (1) inspections to determine whether the Work or a designated portion thereof has attained final completion in accordance with the Contract Documents. The Owner shall deduct from the Contract Sum amounts paid to the Architect for any additional inspections.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect for the record (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

9.11 LIQUIDATED DAMAGES

9.11.1 The Contractor, and the Contractor's surety shall be liable for and shall pay the Owner the sums stipulated on the Bid Form, if any, as liquidated damages for each calendar day of delay after the date established for Substantial Completion in the Contract Documents until the Work is substantially complete.

9.11.2 The Owner has established this amount as the proper measure of liquidated damages which the Owner will sustain per day by the failure of the Contractor to substantially complete the Work at the stipulated time and it is not to be construed in any sense as a penalty.

9.11.3 In addition to Liquidated Damages, the Contractor shall pay to the Owner the cost of extended architectural and engineering (including Architect's on-site representative(s), if any, on-site) services rendered beginning at 61 days from the date of Substantial Completion required by the Contract, as adjusted if applicable, and continuously until final completion is achieved.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner may obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If the Contractor has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor has no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

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ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) working days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Property Insurance. The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum as well as subsequent Contract modifications thereto for the entire Work at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.2.3 Property insurance shall be on an "all-risk" or equivalent policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, collapse, earthquake, flood, windstorm, false work, testing and startup, temporary buildings, and debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents.

§ 11.2.4 If the property insurance requires minimum deductibles and such deductibles are identified in the Contract Documents, the Contractor shall pay costs not covered because of such deductibles.

§ 11.2.5 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

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§ 11.2.6 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

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ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's review and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to review prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense without change to the contract time.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or Owner or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense without change to the contract time.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

12.2.2.4 If required by the Owner and the Architect and, upon request by the Owner and prior to the expiration of one year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance and the Work.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct

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the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense without change to contract time.

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§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and submitted to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so in a timely manner and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven working days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional working days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or Suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

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§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon determination by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be determined by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The

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responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum, Contract Time, or both shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction. Time extensions from adverse weather conditions shall not entitle the Contractor to "extended overhead" recovery.

§ 15.1.6.2.1 Weather data utilized to support claims for adverse weather conditions shall be that obtained from the National Oceanic and Atmospheric Administration (NOAA) for the nearest weather station to the Project. Adverse weather conditions are defined as measurable precipitation (MP) of 0.1 " or more, or 1.0" or more of snow or ice pellets, or freezing temperature (FT) for a day (24 hours) when the temperature remains at 32 degrees Fahrenheit or below. Only measurable precipitation (MP) or freezing temperature (FT) shall be permitted to be claimed for any one calendar day. Time extensions for adverse weather conditions shall be cumulative over the duration of the Project time and claims shall not be permitted for days for drying out of rain-soaked soil, snow accumulation, or similar weather-related conditions or resulting Project conditions.

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.1 The Contractor agrees that it shall not be entitled to a time extension for normal inclement weather (weather conditions other than "adverse weather conditions") which could have been expected at the Project locale due to precipitation or temperature, based upon actual data from the National Oceanic and Atmospheric Administration (NOAA) for the locality closest to the Project for a five-year period preceding the date of the Contract. The Contractor acknowledges and warrants that in making its proposal or bid and Construction Schedule for the Work, it gave due care and consideration to this expected number of calendar days of inclement weather for the locale of the Project and allowed for the impact of normal inclement weather on subsequent Work. During the time of performance, should the expected number of calendar days of normal inclement weather for the locale of the Project be less than originally anticipated by the Contractor and the Owner, at the time of contracting, those days not so affected by normal inclement weather shall be considered float time in the Construction Schedule.

.2 The Contractor agrees that the measure of adverse weather conditions due to MP or FT during the period covered by this Contract shall be the number of days where adverse weather conditions comply with the weather data referenced in subparagraph 15.1.6.2.1.

.3 Extensions of time will be made only for days in which abnormal adverse weather criteria cited in subparagraph 15.1.6.2.1 occur.

.4 If the total calendar days lost due to adverse weather conditions, from the start of the Work at the Project by the Contractor until the principal portions of the Work are enclosed, exceeds the total number of days to be expected to be lost for the same time period, a time extension, if granted, shall only be for the number of calendar days needed to equal the excess number of calendar days lost to such adverse weather conditions.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- **.1** damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- **.2** damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 working days after the Claim has been referred to the Initial Decision Maker, subject to Section 15.2.6 the party asserting the Claim may demand mediation without a decision having been rendered. The Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten working days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

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§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten working days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 working days from the date of receipt of an initial decision, or if no decision has been rendered in accordance with Section 15.2.1, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 working days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 working days from the date of filing, unless stayed for a longer period by agreement of the parties or court order..

§ 15.3.3 Either party may, within 30 working days from the date that mediation has been concluded without resolution of the dispute or 60 working days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 working days after written receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

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Additions and Deletions Report for

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PAGE 1:

South Hill New Police Station

Town of South Hill, Virginia

211 S. Mecklenburg Avenue

South Hill, VA 23970

Moseley Inc.

3200 Norfolk Street

Richmond, VA 23230

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§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all~~; performance~~. Performance by the Contractor shall be ~~required only to the extent~~ consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. Notwithstanding such performance, in case of a conflict, disagreement, or ambiguity, provide the better quality of Work. In case of a conflict, disagreement, or ambiguity, provide the greater quantity of Work.

The Specifications are that portion of the Project Manual and Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

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§ 1.2.1.2 Plumbing, Mechanical, Fire Protection and Electrical drawings are diagrammatic, showing general locations and arrangements of piping, wiring, equipment, security and technology, and specialties; not necessarily showing all required offsets, conditions and appurtenances required for maximum practical accessibility for operation, maintenance and clearances. Coordinate this Work in order to achieve the required and intended Work and notify the Architect immediately of conditions which do not comply or will not allow for this condition.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

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§ 1.5.1 ~~The~~Unless otherwise required by the Owner and Architect Agreement, the Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7, ~~and~~ 1.8, and 1.9 solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery~~.~~, including signature of receiver of such notices.

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The parties shall agree upon ~~written~~ protocols governing the transmission and use of~~, and reliance on,~~ Instruments of Service or any other information or documentation in digital form. The parties shall use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data, should such Exhibit be included in the Agreement.

Any use of, or reliance on, all or a portion of a building information model without agreement to ~~written~~ protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

§ 1.9 If such Exhibits are not included in the Agreement, the Architect may, with the concurrence of the Owner, furnish to the Contractor versions of the Instruments of Service in electronic form. The Contract Documents executed or identified in accordance with Section 1.1.1 shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations involving computers. The Contractor shall not transfer or reuse Instruments of Service in electronic or machine readable form without the prior written consent of the Architect.

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. ~~Except as otherwise provided in Section 4.2.1, the~~ The Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

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If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. ~~Such action by the Owner and amounts~~ Amounts charged to the Contractor ~~are both subject to prior approval of the Architect and the Architect~~ may, pursuant to Section 9.5.1, ~~withhold or~~ nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies,

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including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one electronic copy of the ~~Contract Documents for~~Drawings, Specifications, and Addenda issued, for the purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.6.1 At the Architect's sole discretion, selected electronic (CAD) Drawing files may be made available for use by the Contractor after execution of the Contract for Construction, with the exception of civil grading and layout plans, if authorized by the civil consultant. Such electronic files are not part of the Contract Documents. If available, the Architect shall release them to the Contractor subject to the terms and conditions established by the Architect, to which the Contractor must agree without exception prior to release of the electronic files. Refer to www.moseleyarchitects.com for the Architect's current Request for Electronic (CAD) Files form, which defines the applicable terms and conditions.

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§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.1.4 During the performance of this Contract, the Contractor will include the provisions of the foregoing Sections 3.1.4.1 and 3.1.4.2 in every Subcontract or purchase order of over ten thousand dollars ($10,000.), so that the provisions will be binding upon each Subcontractor or vendor; and furthermore, the Contractor agrees as follows:

.1The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin, except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.

.2The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal opportunity employer.

.3Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting requirements of this section.

.4The Contractor does not, and shall not during the performance of this Contract, knowingly employ an unauthorized alien as defined in the Federal Immigration Reform and Control Act of 1986.

.5Contractor hereby represents it is organized as a stock or non-stock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership and is authorized to transact business in the jurisdiction where the Project is located as a domestic or foreign business entity if so required by Title 13.1 or Title 50 or as otherwise required by law.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such

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form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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§ 3.2.5 The Owner shall deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's requests for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior correspondence or documentation.

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be ~~safe~~appropriate, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative in writing, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.4.2 Except in the case of minor changes in the Work ~~approved~~found to be acceptable by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after ~~evaluation~~review by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.2.1 After the Contract has been executed, the Owner and the Architect will consider a formal request for substitution in lieu of those required by the Contract Documents only under and in addition to, the conditions set forth in the Contract Documents. By making requests for substitutions, the Contractor:

.1represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to requirements of the Contract Documents;

.2represents that the Contractor will provide the same warranty for the substitution that the Contractor is required to provide under the Contract Documents;

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.3certifies that the cost data presented is complete and includes all related costs under this Contract including the Architect's redesign costs, and waives all claims for additional costs and time related to the substitution which subsequently become apparent; and

.4will coordinate and perform the installation of the accepted substitute, making such changes to the Work as may be required for the Work to be complete in all respects.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Owner shall deduct from the Contract Sum amounts paid to the Architect for the Architect to review the Contractor's proposed substitutions, to make agreed-upon changes in the Instruments of Service, including the Contract Documents, and to provide additional construction phase services made necessary by the Owner's acceptance of such substitutions.

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§ 3.6.1 The 179D tax deduction incentivizes building owners and designers for designing energy-efficient building systems, including lighting, HVAC, and building envelope components. Since government entities do not pay taxes, this deduction is not available to the Owner. Current tax code allows for this deduction to be allocated to the Architect by the Owner on eligible projects to help incentivize energy-efficient building design.

§ 3.6.2 The Contractor recognizes that the Architect is the only entity eligible to pursue such allocations in accordance with 26 U.S. Code §179D, which reads in part, "The allocation of the deduction [is] to the person primarily responsible for designing the property in lieu of the owner of such property." The Contractor further acknowledges the Architect as the primary designer of the project for the purposes of 179D and agrees not to pursue the deduction or to request any portion thereof from the Architect or Owner.

§ 3.7.1.1 Unless otherwise provided in the Contract Documents, the Contractor is responsible for obtaining utilities for the Project and providing the Work relating to Project utilities as indicated. Responsibility for payment of fees associated with providing utilities to the Project shall be as follows:

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.1Any fees assessed by entities for providing permanent utilities to the Project shall be paid directly to the utility entities by Owner. These include "tap fees" and "electrical connection and service fee." Contractor shall coordinate the permanent utilities and the entity's related work to comply with the construction schedule.

.2Any fees assessed by entities for providing temporary utilities to the Project for use by Contractor during construction of the Project shall be paid by the Contractor. The Contractor's payment of fees for temporary utilities shall be included in the Base Bid and Contract Sum and will not be reimbursed by the Owner.

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly ~~investigate~~review such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will ~~recommend~~determine that an equitable adjustment should be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination ~~or recommendation,~~ that party may submit a Claim as provided in Article 15.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness. The Contractor shall identify the date for Owner's selection on the critical path of the Contractor's Construction Schedule and provide the Owner a minimum of two weeks notice before this date.

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§ 3.9 Superintendent and Project Manager

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule ~~for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The~~in accordance with section 3.12. Unless otherwise required by the Contract Documents, the submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the ~~approved~~accepted submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

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§ 3.9.1 The Contractor shall employ a competent superintendent and project manager and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent and project manager shall represent the Contractor, and communications given to the superintendent or project manager shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent and project manager. Within 14 days of receipt of the information, the ~~Architect~~Owner may notify the Contractor, stating whether the Owner ~~or the Architect~~ (1) has reasonable objection to the proposed superintendent or project manager or (2) requires additional time for review. Failure of the ~~Architect~~Owner to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent or project manager to whom the Owner ~~or Architect~~ has made reasonable and timely objection. The Contractor shall not change the superintendent or project manager without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.9.4 The Superintendent employed by the Contractor shall have a minimum of five (5) years commercial experience as the primary Superintendent on projects of similar size and complexity as the Work. The superintendent shall speak fluent English and clearly understand the English language. The Contractor shall submit to the Owner a resume and other supporting documentation showing that the proposed Superintendent is competent and has the minimum work experience required to execute the Work. The Owner reserves the right to request additional supporting documentation regarding the proposed Superintendent's qualifications and to require the Contractor to propose an alternate Superintendent who better meets the requirements contained in this Article, as may reasonably be determined by the Owner. The Contractor shall notify the Architect and Owner in writing of any proposed replacement of the Superintendent. The Contractor shall not replace a competent Superintendent without prior written approval from the Owner. The requirements contained in this Article shall apply to any proposed replacement Superintendent, regardless if the proposed tenure is to be temporary or permanent.

§ 3.9.5 The Contractor shall employ a Project Manager to be assigned to the Work. The Project Manager employed by the Contractor shall have a minimum of five (5) years commercial experience as Project Manager on projects of similar size and complexity as the Work. The project manager shall speak fluent English and clearly understand the English language. The Contractor shall submit to the Owner a resume and other supporting documentation showing that the proposed Project Manager is competent and has the minimum work experience required to execute the Work. The Owner reserves the right to request additional supporting documentation regarding the proposed Project Manager's qualifications and to require the Contractor to propose an alternate Project Manager who better meets the requirements contained in this Article, as may reasonably be determined by the Owner. The Contractor shall notify the Architect and Owner in writing of any proposed replacement of the Project Manager. The Contractor shall not replace a competent Project Manager without prior written approval from the Owner. The requirements contained in this Article shall apply to any proposed replacement Project Manager, regardless if the proposed tenure is to be temporary or permanent. The Project Manager shall not act as the Superintendent or replacement for the Superintendent without written approval from the Owner.

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. ~~The~~Unless otherwise required by the Contract Documents; the schedule shall contain ~~detail~~details appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to ~~completion and shall not exceed time limits current under~~the Substantial Completion date and final completion date indicated in the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

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The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other ~~Modifications~~modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required

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submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule ~~approved~~accepted by the Architect or, in the absence of an ~~approved~~accepted submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been ~~approved~~accepted by the Architect.

§ 3.12.8 The Work shall be in accordance with ~~approved~~accepted submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's ~~approval~~acceptance of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written ~~approval~~acceptance to the specific deviation in accordance with 3.12.9 as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's ~~approval~~acceptance thereof.

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§ 3.12.9 The Contractor shall direct specific attention, in writing ~~or~~on a cover letter attached to the original or on the case of a resubmittal, on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to all revisions or deviations other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's ~~approval~~acceptance of a resubmission shall not apply to such revisions or deviations.

§ 3.12.10 The Contractor shall not be required (delegated design) to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If such delegated professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will ~~specify~~provide all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, licensed in the state where the Project is located, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have ~~specified~~provided to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and ~~approve or~~ take ~~other~~ appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittals. The Architect's review of additional resubmittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall to deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

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§ 4.2.2 The Architect will visit the site ~~at intervals appropriate to the stage of construction, or as otherwise~~as agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in ~~accordance~~general compliance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement. Such terms as 'Architect-Engineer,' 'Engineer,' and 'A-E,' if used in these Contract Documents, is intended to mean the Architect and its consultants unless otherwise intended by the context or usage of such terms. Such terms do not mean or include any design professional of the Contractor, Subcontractor, or Owner.

§ 4.1.3 Subject to the standard of care for applying professional judgment to information used or relied upon, Architect and its Consultants may use and rely upon design elements, technical standards, test results, and all other information ordinarily or customarily furnished or published by others, including, but not limited to, specialty contractors, manufacturers, fabricators, and suppliers.

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§ 4.2.2.1 The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect or request of the Contractor.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and ~~promptly~~endeavor to report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) known defects and deficiencies ~~observed~~ in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and ~~approve, or~~ take ~~other~~ appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for general conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken ~~in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule,~~ with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of ~~other~~ details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor ~~as required by the Contract Documents~~. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute ~~approval~~acceptance of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's ~~approval~~acceptance of a specific item shall not indicate ~~approval~~acceptance of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will ~~investigate~~review and make determinations ~~and recommendations~~ regarding concealed and unknown conditions as provided in Section 3.7.4.

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§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the

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Contract, shall ~~notify~~submit to the Owner and Architect ~~of~~ the persons or entities proposed for each principal portion of the Work (list of proposed subcontractors), including those who are to furnish materials or equipment fabricated to a special design no later than two days prior to the date of the Pre-construction Conference. Include Contractor's License number and Class for each proposed Subcontractor. Within 14 days of receipt of the information, the ~~Architect~~Owner may notify the Contractor whether the Owner ~~or the Architect~~ (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the ~~Architect~~Owner to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.3 If the Owner ~~or Architect~~ has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner ~~or Architect~~ has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner ~~or Architect~~ makes reasonable objection to such substitution.

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By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the complete Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors ~~will~~shall similarly make available copies of ~~applicable portions of such documents available~~the complete Contract Documents to their respective proposed Sub-subcontractors.

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~~§ 7.3.1~~ Directive shall be used in the absence of total agreement on the terms of a Change Order. A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Owner and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Owner and Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner

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may clean up and the Architect will allocate the cost among those responsible between the Owner, Separate Contractors, and Contractor.

~~§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.~~

~~§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.~~

~~§ 7.2 Change Orders~~

~~§ 7.2~~ 7.1.1.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

§ 7.~~3~~1.1.2 A Construction Change ~~Directives~~

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~~§ 7.31.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.~~

~~§ 7.3.3~~1.2.1 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.4 As provided in Section 7.~~3~~2.~~4.~~

§ 7.~~3.4 If~~1.1.2.2 Upon receipt of a Construction Change Directive, the Contractor ~~does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following~~shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.1.1.2.3 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.1.1.2.4 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional opinion, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change

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Directive, or order for a minor change in the Work.

7.1.4 If a change in the Work results in an adjustment to the Contract Sum, the adjustment (increase or decrease) shall be based on the following, unless noted otherwise:

.1~~Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;~~Material quantities and unit prices (separated into trades; include sales tax).

.2 Labor costs (raw cost).

.3Labor burden, applied to labor only, including but not limited to, worker's compensation and public liability, social security tax, old age and unemployment insurance, union welfare fund and fringe benefits. Contractor shall be required to substantiate the labor burden percentage applied to any change in contract amount. Labor burden percentage shall not exceed 30% in any case.

.2~~Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;~~4 Construction equipment cost.

.5 Overhead and profit combined (on Claims for net increase only), as defined in Section 7.3.11.

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.3~~Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;~~6 Cost of Premiums for Bonds (for Contractor only). Evidence of additional premium for bond shall be submitted with Claim.

.4 7Extended Overhead Costs ~~of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and~~

.5 ~~Costs of supervision and field office personnel directly attributable to the change.~~

~~§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.~~

~~§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.~~

~~§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order~~(if applicable) which shall be established by pro-rating the value of supervision, temporary facility, and General Conditions and all other direct and indirect costs of Contractor included in the Contract Sum over the number of days included in the Contract Time.

§ 7.2.1 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth, a reasonable amount. In such case, and also under Section 7.1.1.2.1.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data which shall include, at the Architect's sole discretion, a cost breakdown itemized in accordance with the current appropriate Data Book and edition of R. S. Means Company, Inc., or other source of construction industry cost data acceptable to the Architect.

.1Overhead shall include, but not be limited to, project management, field office personnel including supervision, superintendence, wages of timekeepers, watchmen and clerks, small tools, incidentals, general office expenses, insurance

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premiums, and all other expenses not included in "costs."

.2 If the net value of the change results in a credit, the credit given shall be the net cost without overhead or profit (for Contractor, Subcontractor, or Sub-subcontractor). The cost as used herein shall include all items of labor, materials, equipment, premiums and bonds.

§ 7.2.2 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.~~3~~2.~~8~~3 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

~~§ 7.32.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 154~~ When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

7.3. In Sections 7.2 and 7.2.1, the amount for overhead and profit combined, included in the total cost to the Owner, shall be based on the following schedule:

.1 for the Contractor, for Work performed by the Contractor's own forces, 15 percent of the cost.

.2for the Contractor, for Work performed by the Contractor's Subcontractors, 5 percent of the amount due the Subcontractors.

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.3for each Subcontractor involved, for Work performed by that Subcontractor's own forces, 15 percent of the cost.

.4for each Subcontractor involved, for Work performed by the Subcontractor's Sub-subcontractor, 5 percent of the amount due the Sub-subcontractor.

.5 cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.2.

~~§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.~~6In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs in the manner prescribed above. Where major cost items are changes to Subcontracts, they shall be itemized also. In no case will a change involving over $500.00 be approved without such itemization.

~~The~~In the Architect's opinion, Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives

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any adjustment to the Contract Sum or extension of the Contract Time.

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, ~~unusual delay in deliveries,~~ unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine and the Owner approves.

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§ 9.3.1.1 As provided in Section 7.~~3.9~~1.1.2.4, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.3 Until final completion, the Owner will pay 95% of the amount due the Contractor on account of progress payments.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.2.1 Contractor shall provide invoices, package slips, or other form of supporting data for materials stored on-site claimed on the progress payment, unless it can be verified through on-site observations. Maintain concise bill of materials and label materials stored on-site for ready identification and verification.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

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§ 9.4.1 The Architect will, unless otherwise agreed upon, within seven working days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in ~~accordance~~general conformance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for general conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the

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issuance of a Certificate for Payment ~~will~~is not ~~be~~ a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

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§ 9.6.~~2~~1.1 The Owner may withhold payments to the Contractor notwithstanding the Architect's certification if it is necessary, in the Owner's opinion, to do so to protect the Owner from loss due to any of the reasons set forth in Sections 9.5.1.1 through 9.5.1.7.

9.6.2 Payment of Subcontractors

§ 9.6.2.1 The Contractor shall pay each Subcontractor, no later than seven working days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.2.2 Within seven (7) working days after receipt of amounts paid to the Contractor by the Owner for Work performed under this Agreement, the Contractor shall do one of the following:

a.Pay each Subcontractor for the proportional share of the total payment received from the Owner attributable to the Work performed by the respective Subcontractor under This Agreement; or

b.Notify the Owner and Architect, and Subcontractor, in writing, of the Contractor's intention to withhold all or part of the Subcontractor's payment with the reason for nonpayment.

9.6.2.3 The Contractor shall pay interest to each Subcontractor on all amounts owed by the Contractor that remain unpaid after seven (7) days following receipt by the Contractor of payment from the Owner for Work performed by the affected Subcontractor under this Agreement, except for amounts withheld as allowed in Section 9.6.8.1. Unless otherwise provided under the terms of this Agreement, for purposes solely of these prompt payment provisions, interest shall accrue at the rate of one percent (1%) per month.

9.6.2.4 In each Subcontract, the Contractor shall include a provision requiring each Subcontractor to include or otherwise be subject to the same payment and interest requirements with respect to each lower-tier Subcontractor (Sub-Subcontractor).

9.6.2.5 The Contractor's obligation to pay interest to a Subcontractor pursuant to the prompt payment provisions is not an obligation of the Owner, and no modification shall be made to this Agreement and no cost reimbursements claim shall be made for the purpose of providing reimbursement by Owner for such interest charge.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

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If, unless otherwise agreed upon, the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven working days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven working days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional working days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of

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shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8.1 Substantial Completion is the stage ~~in the progress of the Work~~ when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can fully occupy or utilize the Work or designated portion thereof, for its intended use with all of the Work's parts and systems operable as required by the Contract Documents. Only incidental cleaning, if required beyond cleaning needed for the Owner's full occupancy or utilization, may remain for final completion.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected ~~prior to final payment~~. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the ~~Architect's inspection~~Architect discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

~~§~~ 9.8.3.1 The Architect will provide no more than one (1) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner shall deduct from the Contract Sum amounts paid to the Architect for any additional inspections.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

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§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly ~~inspect~~review the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in ~~accordance~~general compliance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

~~§~~ 9.10.1.1The Architect will provide no more than one (1) inspections to determine whether the Work or a designated portion thereof has attained final completion in accordance with the Contract Documents. The Owner shall deduct from the Contract Sum amounts paid to the Architect for any additional inspections.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect for the record (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of

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no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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9.11 LIQUIDATED DAMAGES

9.11.1 The Contractor, and the Contractor's surety shall be liable for and shall pay the Owner the sums stipulated on the Bid Form, if any, as liquidated damages for each calendar day of delay after the date established for Substantial Completion in the Contract Documents until the Work is substantially complete.

9.11.2 The Owner has established this amount as the proper measure of liquidated damages which the Owner will sustain per day by the failure of the Contractor to substantially complete the Work at the stipulated time and it is not to be construed in any sense as a penalty.

9.11.3 In addition to Liquidated Damages, the Contractor shall pay to the Owner the cost of extended architectural and engineering (including Architect's on-site representative(s), if any, on-site) services rendered beginning at 61 days from the date of Substantial Completion required by the Contract, as adjusted if applicable, and continuously until final completion is achieved.

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§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner ~~and Architect~~.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner ~~shall~~may obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor ~~and Architect~~ the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor ~~and the Architect~~ will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If ~~either~~ the Contractor ~~or Architect~~ has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor ~~and the Architect have~~has no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

~~§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.~~

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§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

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§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails toThe Contractor shall purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum as well as subsequent Contract modifications thereto for the entire Work at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) businessworking days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

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§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required Property insurance shall be on an "all-risk" or equivalent policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, collapse, earthquake, flood, windstorm, false work, testing and startup, temporary buildings, and debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents.

§ 11.2.4 If the property insurance requires minimum deductibles and such deductibles are identified in the Contract

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Documents, the Contractor shall pay costs not covered because of such deductibles.

§ 11.2.5 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.2.6 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance.

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§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's ~~examination~~review and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to ~~examine~~review prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense without change to the contract time.

The Contractor shall promptly correct Work rejected by the Architect or Owner or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense without change to the contract time.

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§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. ~~The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.~~

~~§~ 12.2.2.4If required by the Owner and the Architect and, upon request by the Owner and prior to the expiration of one year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance and the Work.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

The Contract shall be governed by the law of the place where the Project is located~~, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4~~.

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§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense without change to contract time.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and ~~promptly delivered~~submitted to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so ~~promptly~~in a timely manner and, where practicable, at the normal place of testing.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven working days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

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§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional working days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or ~~suppliers~~Suppliers;

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon ~~certification~~determination by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be ~~certified~~determined by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

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§ 15.1.6.2.1 Weather data utilized to support claims for adverse weather conditions shall be that obtained from the National Oceanic and Atmospheric Administration (NOAA) for the nearest weather station to the Project. Adverse weather conditions are defined as measurable precipitation (MP) of 0.1 " or more, or 1.0" or more of snow or ice pellets, or freezing temperature (FT) for a day (24 hours) when the temperature remains at 32 degrees Fahrenheit or below. Only measurable precipitation (MP) or freezing temperature (FT) shall be permitted to be claimed for any one calendar day. Time extensions for adverse weather conditions shall be cumulative over the duration of the Project time and claims shall not be permitted for days for drying out of rain-soaked soil, snow accumulation, or similar weather-related conditions or resulting Project conditions.

§ 15.1.4.2 The Contract Sum, ~~and~~ Contract Time, or both shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

If the Contractor wishes to make a Claim for an increase in the Contract Sum~~,~~ notice as provided in Section 15.1.3 shall be

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given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction. Time extensions from adverse weather conditions shall not entitle the Contractor to "extended overhead" recovery.

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§ 15.2.2 The Initial Decision Maker will review Claims and within ten working days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

.1The Contractor agrees that it shall not be entitled to a time extension for normal inclement weather (weather conditions other than "adverse weather conditions") which could have been expected at the Project locale due to precipitation or temperature, based upon actual data from the National Oceanic and Atmospheric Administration (NOAA) for the locality closest to the Project for a five-year period preceding the date of the Contract. The Contractor acknowledges and warrants that in making its proposal or bid and Construction Schedule for the Work, it gave due care and consideration to this expected number of calendar days of inclement weather for the locale of the Project and allowed for the impact of normal inclement weather on subsequent Work. During the time of performance, should the expected number of calendar days of normal inclement weather for the locale of the Project be less than originally anticipated by the Contractor and the Owner, at the time of contracting, those days not so affected by normal inclement weather shall be considered float time in the Construction Schedule.

.2The Contractor agrees that the measure of adverse weather conditions due to MP or FT during the period covered by this Contract shall be the number of days where adverse weather conditions comply with the weather data referenced in subparagraph 15.1.6.2.1.

.3Extensions of time will be made only for days in which abnormal adverse weather criteria cited in subparagraph 15.1.6.2.1 occur.

.4If the total calendar days lost due to adverse weather conditions, from the start of the Work at the Project by the Contractor until the principal portions of the Work are enclosed, exceeds the total number of days to be expected to be lost for the same time period, a time extension, if granted, shall only be for the number of calendar days needed to equal the excess number of calendar days lost to such adverse weather conditions.

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 working days after the Claim has been referred to the Initial Decision Maker, subject to Section 15.2.6 the party asserting the Claim may demand mediation ~~and binding dispute resolution~~ without a decision having been rendered. ~~Unless the~~ The Initial Decision Maker ~~and all affected parties agree, the Initial Decision Maker~~ will not decide disputes between the Contractor and persons or entities other than the Owner.

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§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten working days after receipt of the request, and shall either (1) provide a response

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on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.6 Either party may file for mediation ~~of an initial decision~~ at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 working days from the date of receipt of an initial decision, or if no decision has been rendered in accordance with Section 15.2.1, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 working days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 working days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. ~~If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings~~.

§ 15.3.3 Either party may, within 30 working days from the date that mediation has been concluded without resolution of the dispute or 60 working days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 working days after written receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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~~§ 15.4 Arbitration~~

~~§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.~~

~~§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.~~

~~§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.~~

~~§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.~~

~~§ 15.4.4 Consolidation or Joinder~~

~~§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may~~

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~~consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).~~

~~§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.~~

~~§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.~~

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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 11:56:50 EDT on 10/09/2026 under Order No. 20250092556 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ - 2017, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

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**SUPPLEMENTARY GENERAL CONDITIONS
OF THE CONTRACT FOR CONSTRUCTION**

This document supplements, modifies, changes, deletes from or adds to the "General Conditions of the Contract for Construction," AIA Document A201, 2017. Where any Article, Section, Subsection or Clause of the General Conditions is not modified or deleted by these Supplementary General Conditions, the unaltered provisions of that Article, Section, Subsection or Clause shall remain in effect.

ARTICLE 1: GENERAL PROVISIONS

DELETE THE LAST SENTENCE OF § 1.1.1 AND REPLACE WITH THE FOLLOWING:

§ 1.1.1 The Contract Documents shall include the bidding documents including, but not limited to, the Invitation for Bids, and the Bid Form.

ADD NEW SECTION 1.1.2.1 AFTER § 1.1.2:

§ 1.1.2.1 General Provisions: Nothing in any resulting Contract shall be construed as authority for either party to make commitments which will bind the other party beyond the scope of service contained herein. The Contract and the obligations of the Owner are contingent upon sufficient funding of the Project, and the Owner shall be bound under the Contract only to the extent that there are funds available to perform its obligations under the Contract.

MODIFY § 1.1.3 AS FOLLOWS:

ADD THE FOLLOWING TO THE END OF THE FIRST SENTENCE:

§ 1.1.3 including any subcontractor's and sub-subcontractor's work and material suppliers or any other entity for which the Contractor is responsible and whether on or off the site of the Project.

ADD THE FOLLOWING SECTIONS AFTER § 1.2.3.

§ 1.2.4 Equipment and materials specified herein shall be furnished complete with all features normally provided with such items, although all features of design and construction may not be specified in complete detail. Such features shall be subject to the approval of Architect and shall include all standard accessories and appurtenances normally provided or which are required for safe operation.

§ 1.2.5 Where references are made throughout the specifications to standards or specifications of trade associations, standards and testing organizations, or to the directions, recommendations or specifications of manufacturers, in all cases the latest approved printed copies of these items shall apply, and all Work shall be done in accordance therewith.

§ 1.2.6 Modifications or exceptions to standards shall be considered as amendments, and unmodified portions shall remain in full effect.

ARTICLE 2: OWNER

DELETE § 2.1.2 IN ITS ENTIRETY.

DELETE § 2.2.1 IN ITS ENTIRETY.

MODIFY THE END OF THE FINAL SENTENCE OF § 2.2.2 AS FOLLOWS.

§ 2.2.2 Delete ", plus interest as provided in the Contract Documents".

DELETE § 2.2.3 IN ITS ENTIRETY.

MODIFY § 2.3.3 AS FOLLOWS:

§ 2.3.3 Delete the words "to whom the Contractor has no reasonable objection and".

ADD THE FOLLOWING TO THE END OF § 2.3.5:

§ 2.3.5 Failure of the Owner to notify the Contractor of necessary corrections or to stop Work shall not relieve the Contractor of any responsibilities or obligations of the Contract Documents.

ADD A NEW SECTION FOLLOWING § 2.4:

§ 2.4.1 In case of failure to deliver goods or services in accordance with the Contract terms and conditions, Owner, after due written notice, may procure them from other sources and hold the Contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies which Owner may have.

ADD A NEW SECTION FOLLOWING § 2.5:

§ 2.6 ADDITIONAL RIGHTS

The rights stated in Article 2 shall be in addition to and not in limitation of any other rights of the Owner granted in the Contract Documents or at law or in equity.

ARTICLE 3: CONTRACTOR

DELETE .4 of § 3.1.4 AND REPLACE WITH:

.4 Use of Child Labor Prohibited. Pursuant to Virginia Code § 2.2-4311.4, Contractor agrees that it will not use forced or indentured child labor in the performance of the contract.

DELETE .5 OF § 3.1.4, REPLACE WITH THE FOLLOWING:

.5 Drug-Free Workplace. During the performance of this Contract, the Contractor agrees to (i) provide a drug-free workplace for the Contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; and (iii) state in all solicitations or advertisements for employees placed by or on behalf of the Contractor that the Contractor maintains a drug-free workplace. "Drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a contractor in accordance with the Virginia Public Procurement Act, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

AFTER § 3.1.4, ADD THE FOLLOWING SECTION:

§ 3.1.5 Contractor hereby represents it is organized as a stock or non-stock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability

partnership and is authorized to transact business in the jurisdiction where the Project is located as a domestic or foreign business entity if so required by Title 13.1 or Title 50 or as otherwise required by law. The Contractor shall maintain a valid certificate of authority or registration to transact business in Virginia with the Virginia State Corporation Commission as required by Title 13.1 or Title 50 of the Code of Virginia, during the term of the Contract or any Contract renewal. The Contractor shall not allow its existence to lapse or its certificate of authority or registration to transact business in the Commonwealth to be revoked or cancelled at any time during the terms of the contract. If the Contractor fails to remain in compliance with the provisions of this section, the contract may be voided by the County.

MODIFY § 3.5.1 AS FOLLOWS:

§ 3.5.1 Add the word "proximately" between the word "defect" and the word "caused" in line six.

ADD THE FOLLOWING NEW SECTIONS AFTER § 3.5.2:

§ 3.5.3 Except as otherwise specified for a longer period in the Contract Documents, all Work shall be guaranteed by the Contractor against defects resulting from the use of inferior materials, equipment or workmanship for one year from the date of Substantial Completion of the Work. The guarantee shall not apply to Work which has been abused or not maintained by the Owner or its successors in interest as instructed by the Contractor or as otherwise provided in § 3.5.1. At the end of the 11th month from the commencement of the warranty period, the Owner shall schedule a walk-through inspection with the Contractor and Architect to identify any warranty items to be corrected under such warranty period. Nothing in this section shall relieve the Contractor from correcting defective work that did not comply with the Contract Documents. If any work is determined to be defective, the Contractor will be responsible to correct the work whenever the defect is discovered.

§ 3.5.4 The guarantee period for any system or systems on which required tests have not been successfully performed as of the Date of substantial completion for the Work, due to seasonal or other limitations, shall begin after the required tests have been successfully performed.

§ 3.5.5 See technical specifications for any additional warranty requirements which are incorporated here by reference.

§ 3.5.7 The Contractor shall deliver to the Owner any bonds, guarantees or warranties issued by the manufacturers on items of equipment furnished under this Contract. Where guarantees or warranties are written in any division of Specifications for a period of more than two years, such longer terms shall apply.

§ 3.5.8 The Contractor shall reasonably respond to all warranty work within five (5) days of notification, or the Owner shall have the work repaired by others and backcharged to the Contractor. The Contractor shall adequately respond to emergency situations within 24 hours, immediately upon notification and supply results of the findings with remedy to the Owner in a timely manner.

DELETE § 3.7.1 AND REPLACE WITH THE FOLLOWING:

§ 3.7.1 The Contractor shall secure and pay for all applicable permits, governmental fees and licenses necessary for the proper execution and completion of the Work, including but not limited to, erosion control bonds and land disturbance permits.

ADD THE FOLLOWING NEW SECTIONS AFTER § 3.10:

§ 3.10.4 The Work shall be executed at such a rate as will assure meeting the specified Substantial Completion date(s) within the time/dates provided in the specifications. By execution of the Contract, the Contractor represents it has analyzed the Work, the materials and methods involved,

the systems of building, availability of qualified labor, restrictions of the site, constraints imposed, workload and capacity to perform the Work, and agrees that the specified times are reasonable considering the existing conditions prevailing in the locality of the Work, including weather conditions, and other factors, with reasonable allowance for variations from average or ideal conditions.

§ 3.10.5 The Substantial Completion date(s) provided are considered essential to the satisfactory performance of this Contract and to the coordination of all Work on the Project. The Owner reserves the right to require the Contractor to prosecute the Work in accordance with the Contractor's Construction Schedule and satisfactorily complete the Work by the Substantial Completion date. The Contractor is responsible to provide the operations, manpower, resources, materials, and all items and work necessary to complete the Work and meet the Substantial Completion and Final Completion dates provided. The Contractor understands and agrees that: the Substantial Completion, Final Completion, actual start and completion dates, rate of progress, and coordination are essential conditions of this Project. It is understood and agreed that TIME IS OF THE ESSENCE and the Contractor agrees to diligently follow and adhere to the Schedule with due diligence so as to execute the Work within the Substantial Completion and Final Completion dates and time frames stipulated in the Contract Documents. The Contractor shall, at no additional cost to the Owner, take all necessary steps, including overtime, double shifts, weekends, and holiday work to complete this Work and meet the Substantial Completion and Final Completion dates stipulated in the Contract Documents in the event of any delays that are not excusable or otherwise the responsibility of the Owner.

§ 3.10.6 Should any of the following conditions exist for delays that are not excusable or otherwise the responsibility of the Owner, the Contractor shall, at no extra cost to the Owner, prepare a Short Term Recovery Schedule to describe in detail how he will regain compliance with the originally approved Contractor's construction schedule:

a. If the Work is ten days behind the approved Schedule.

b. If the Contractor proposes a change in the approved Schedule.

Until such Recovery Schedule is approved, the Architect may decline to certify payment in accordance with Article 9.5.1 of the General Conditions.

SUPPLEMENT § 3.13 BY ADDING THE FOLLOWING:

§ 3.13.1 Unless otherwise indicated on the drawings or as directed by the Owner, the property lines shall be the limits of construction and all Work shall be confined therein, including the storage of materials and equipment at the site.

INSERT THE FOLLOWING AT THE END OF THE SECOND SENTENCE OF § 3.14.1:

§ 3.14.1 Only appropriate, qualified Subcontractors and skilled tradesmen shall do the Work.

ADD THE FOLLOWING TO § 3.14:

§ 3.14.3 No alteration of structural members shall be done without the prior approval of the Architect of the specific nature, size and location of such alteration. Approval to alter structural members shall not be construed to affect the Contractor's responsibility for the adequacy of the strength of such members providing such alteration be performed in accordance with the Architect's approval.

MODIFY § 3.15.1 AS FOLLOWS:

§ 3.15.1 Add the word "all" between the words "remove" and "waste."

MODIFY § 3.15.2 AS FOLLOWS:

§ 3.15.2 delete "Owner shall be entitled to reimbursement from the Contractor" and add "the cost thereof shall be charged to the Contractor and may be deducted from funds paid to the Contractor, or the Contractor shall pay the amount due within ten (10) days of the date of any statement of amounts due."

MODIFY § 3.16 AS FOLLOWS:

§ 3.16 Add "reasonable" in line one between "with" and "access.

Add "(both as to time and to location)" between "access" and "to".

Following the period, add the following: The Contractor shall not unreasonably withhold access.

MODIFY THE THIRD SENTENCE OF § 3.17 AS FOLLOWS:

§ 3.17 "If the Contractor has reason to believe that any required design, process or product is an infringement of a patent, the Contractor shall not be responsible for any such loss if such information is promptly furnished to the Architect and the Owner in writing."

MODIFY § 3.18.1 AS FOLLOWS:

§ 3.18.1 In the first line, add a comma and the word "defend" after the word "indemnify."

In the fifth line, delete "(other than the Work itself), but only to the extent. . ."

In the sixth line, add the words "materialman, supplier,. . ." after the word "Subcontractor," and before the word "anyone."

In the seventh line, insert "as contemplated by subparagraph § 3.3.2. . ." after the word "liable"

Add the following sentence at the end of the paragraph "The requirements of this Paragraph shall be incorporated into the Contractor's insurance policies in a manner approved by the Owner."

ADD A NEW § 3.19:

§ 3.19 CONTRACTOR'S REPRESENTATIONS

§ 3.19.1. By entering into this Contract with the Owner, the Contractor represents and warrants the following, together with all other representations and warranties in the Contract Documents:

.1 That it is experienced in and competent to perform the type of work required and to furnish the plant, materials, supplies or equipment to be so performed or furnished by it;

.2 That it is financially solvent, able to pay its debts as they mature, and possessed of sufficient working capital to initiate and complete the Work required under the Contract;

.3 That it is familiar with all federal, state, county, municipal and department laws, ordinances, permits, regulations and resolutions which may in any way affect the Work or those employed therein, including but not limited to any special laws or regulations relating to the Work or any part thereof;

.4 That such temporary and permanent Work required by the Contract Documents which is to be done by it will be satisfactorily constructed and fit as provided in the Contract Documents;

.5 That it will fully comply with all requirements of the Contract Documents;

.6 That it will perform the Work consistent with good workmanship, sound business practice, and in the most expeditious manner consistent with the Contract Documents;

.7 That it will furnish efficient business administration and experienced superintendence and an adequate supply of workmen, equipment, tools and materials at all times;

.8 That it has carefully reviewed the Work required and that the Work can be planned and executed in a normal and orderly sequence of work and reasonably scheduled so as to ensure completion of the Project in accordance with the Contract Documents, allowing for normal and reasonably foreseeable weather;

.9 That it will complete the Work within the Contract Time and all portions thereof within any required Contract deadlines unless delayed by excusable events or acts of the Owner;

.10 That its Contract price is based upon the labor, materials, systems and equipment required by the Contract Documents; and

.11 That it shall comply, and shall cause all subcontractors to comply, with all applicable federal, state, and local statutes, laws, rules, ordinances, orders, directives, permits and regulations, whether now existing or hereafter promulgated, of all governmental agencies, whether federal, state, or local and whether legislative judicial or executive (collectively "Applicable Laws" or "applicable laws") relating to Contract Documents and the performance of the Work, including but not limited to all Commonwealth of Virginia Employment Discrimination and Equal Opportunity laws and regulations and Commonwealth of Virginia Procurement and Hiring laws and regulations.

ARTICLE 4: ARCHITECT

MODIFY THE SECOND LINE OF § 4.1.2 AS FOLLOWS:

§ 4.1.2 Delete ", Contractor,".

MODIFY THE THIRD LINE OF § 4.2.2 AS FOLLOWS:

§ 4.2.2 Delete "in a manner indicating that the Work, when fully completed, will be"

MODIFY § 4.2.12 AS FOLLOWS:

§ 4.2.12 Delete ", will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith"

ARTICLE 5: SUBCONTRACTORS

ADD THE FOLLOWING TO THE END OF § 5.2.1:

§ 5.2.1 The Contractor understands and agrees that it alone is responsible to the Owner for all of the Work under this Contract and that any review of Subcontractors or suppliers will not in any way make the Owner responsible to, or for, the actions or failures of any Subcontractor or supplier. The Contractor and any of its Subcontractors or suppliers shall not contract with any proposed Subcontractor or supplier against which reasonable objection has been made under the provisions of this paragraph.

DELETE THE END OF THE LAST SENTENCE OF § 5.2.3 AND REPLACE WITH THE FOLLOWING:

§ 5.2.3 Delete all text in the last sentence that follows "unless,". In place of deleted text, insert the following "(i) it is initiated as a result of the Owner's or Architect's objections, (ii) the Contractor has acted promptly and responsively in submitting names as required and (iii) the Contractor relied on a quotation from such person or entity to whom the Owner or Architect has objected in preparing its response to the Owner's Invitation to Bid and in establishing the Contract Sum and the Contract Time. Also, no increase in the Contract Sum shall be allowed unless the Owner has approved the increased contract amount of the subcontract with the replacement Subcontractor prior to the Contractor's contracting with the replacement Subcontractor."

ADD THE FOLLOWING SUBPARAGRAPHS AFTER § 5.3:

§ 5.3.1 The Contractor will not be released from any part of his liabilities or obligations under its Contract should any Subcontractor fail to perform in a satisfactory manner the work undertaken by it.

§ 5.3.2 Nothing contained in the Contract shall be construed as creating any contractual relationship between any Subcontractor and Owner. The sections of the specifications do not control the Contractor in dividing the work among Subcontractors or limit the work performed by any trade.

§ 5.3.3 The Contractor shall be responsible to the Owner for acts and omissions of his own employees, and of Subcontractors and their employees. He shall also be responsible for the coordination of the work of the trades, Subcontractor's and suppliers.

§ 5.3.4 The Architect will not undertake to settle any differences between or among the Contractor and his Subcontractors or suppliers.

§ 5.3.5 The Contractor shall, without additional expense to the Owner, employ specialty Subcontractors where required by the specifications. "Specialty Subcontractors," when specified as a requirement, means a Subcontractor regularly engaged in the manufacture or installation of the contract items. The specialty Subcontractor shall select and combine the materials involved and maintain and have available for the purpose workmen skilled in the specified work. The specialty Subcontractor shall be the manufacturer, be licensed by the manufacturer as an installer, or work under direct supervision of the manufacturer.

MODIFY THE LAST SENTENCE OF § 5.4.1 AS FOLLOWS:

§ 5.4.1. After "under the subcontract" add ", provided, however, that the Owner shall not be liable for any breach or default of the Contractor under such subcontract agreement, and the Contractor shall remain solely liable for any such breach or default".

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

ADD THE FOLLOWING SUBPARAGRAPH AFTER § 6.1:

§ 6.1.5 The Owner shall have the right to deliver and move furniture and equipment into the building prior to completion of the Work by the Contractor if this furniture and equipment does not seriously

interfere with the Contractor's operations. Questions of what constitutes interference shall be referred to the Architect.

ARTICLE 7: CHANGES IN THE WORK

ADD THE FOLLOWING TO § 7.2:

§ 7.2.2. CONTRACT COST PROPOSAL: Unless otherwise required, the Contractor shall, within ten (10) days following receipt of such written authorization, submit in writing to the Architect a proposal for accomplishing such change, addition or extra work. The proposal shall set forth any increase or decrease in cost to the Owner known by Contractor as of the date of submission. The proposal shall state the basis of compensation for all work in connection with any such change, addition or extra work. Adequate supporting documentation is required to accompany the proposal. All Change Order proposed pricing shall be valid for a minimum of thirty (30) days.

§ 7.2.3 Contractor's quotation for changes in the Work shall be valid by for not less than thirty (30) days from the date of receipt of quotation by Owner and Architect.

MODIFY § 7.3.1 AS FOLLOWS:

§ 7.3.1 Add, "and may adjust" after "other revisions," and delete "being adjusted" in the second sentence.

MODIFY § 7.3.7 AS FOLLOWS:

§ 7.3.7 In line three, substitute "the Owner shall initiate the" for "shall be recorded as a".

ADD NEW SECTION, § 7.3.11, FOLLOWING § 7.3.10:

§ 7.3.11 In Subparagraphs 7.2.2 and 7.3.4 the following conditions shall apply:

.1 Overhead shall include, but not be limited to, supervision, superintendence, wages of timekeepers, watchmen and clerks, small tools, incidentals, general office expenses, insurance premiums, and all other expenses not included in "costs."

.2 If the net value of the change results in a credit, the credit given shall be the net cost without overhead or profit (for Contractor, Subcontractor, or Subsubcontractor). The cost as used herein shall include all items of labor, materials, equipment, premiums and bonds.

.3 If the Contract price is adjusted in accordance with this Section, the maximum adjustment for overhead and profit (regardless of the extent of the adjustment to the Contract Time, if any) shall be as follows:

a. For the Contractor, for any work performed by its own forces, 15% of actual field cost;

b. For each Subcontractor involved, for any work performed by its own forces, 15% of the actual field cost;

c. For each Sub-subcontractor involved, for any work performed by its own forces, 15% of the actual field cost;

d. For the Contractor, for work performed by each Subcontractor, 7.5% of the sum of Subcontractor's actual field cost plus Sub-subcontractor costs plus the Subcontractor's allowance for overhead and profit as defined above.

e. "Cost of machinery and equipment" shall be charged separately for "actual field cost," shall not be subject to markup for overhead or profit, and shall be based on actual rentals, unless the machinery or equipment is owned by the Contractor. Machinery and equipment owned by the Contractor shall be charged according to Blue Book rates Equipment supplied by separate divisions of the contractor's organization shall be considered rental equipment.

f. The allowance for "overhead and profit" to be paid the Contractor shall cover and compensate him for his profit, overhead, general superintendence and field office expense, general and administrative home office expense, and all other elements of cost and expense not embraced within the "actual field cost" or "cost of machinery and equipment" as herein defined.

ARTICLE 8: TIME

ADD NEW SECTION, § 8.1.2.1, AFTER § 8.1.2.

§ 8.1.2.1 The Contractor must commence Work under this Contract within the number of days after date of receipt by it of Notice to Proceed as specified in the Notice to Proceed or as otherwise agreed to by the Parties in a writing signed by an authorized representative from each Party. The Contractor shall execute said Work diligently, and to complete the entire Work ready for use as specifically set forth in the Contract.

SUPPLEMENT § 8.1.3 BY ADDING THE FOLLOWING:

§ 8.1.3 As to all acts or failures to act occurring prior to the relevant Date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events as of such Date of Substantial Completion; as to all acts of failures to act occurring subsequent to the relevant Date of Substantial Completion, any applicable statute of limitations shall be deemed to have accrued in any and all events as of the date of issuance of the final Certificate for Payment.

MODIFY § 8.2.1 AS FOLLOWS:

§ 8.2.1 In line 2 after "Work", add ", and the Contractor is capable of properly completing the work within the Contract Time."

MODIFY § 8.3.1 AS FOLLOWS:

§ 8.3.1 In line 4, delete "(4) by delay authorized by the owner pending mediation and binding dispute resolution; . . ."

In line five, replace "(5)" with "(4)".

Add the following at the end of the subparagraph: "Notwithstanding any other provisions to the contrary, any delay solely occasioned by the Contractor, Subcontractors, or Sub-subcontractors or the employees or agents of same, shall not warrant an extension of the Contract time."

MODIFY SUBPARAGRAPH § 8.3.2 AS FOLLOWS:

§ 8.3.2 Delete the words “Article 15” and substitute, “this Contract”.

ARTICLE 9: PAYMENT AND COMPLETION

MODIFY § 9.1.2 AS FOLLOWS:

§ 9.1.2 In line three delete “shall” and add “may, by written agreement signed by both the Owner and the Contractor,”

MODIFY § 9.2 AS FOLLOWS:

§ 9.2 In the fourth line add “or the Owner” after “Architect” and before “shall be used.”

MODIFY § 9.3.3 AS FOLLOWS:

§ 9.3.3 On the third and fourth lines, delete “, to the best of the Contractor’s knowledge, information and belief,”

At the end of subparagraph § 9.3.3 add the following. “Notwithstanding any other language to the contrary contained in the Contract Documents, title to work completed passes by incorporation of the Work in the construction or by payment, whichever occurs first.”

MODIFY § 9.4.2 AS FOLLOWS:

§ 9.4.2 Delete “and” in the fourth line between “Contract Documents” and “that the Contractor is entitled.” In the place of “and,” insert a comma.

At the end of the first sentence, add “and that sufficient funds remain unpaid from the Contract Sum to complete the Work for which the Contractor or its Subcontractors have responsibility under the Contract Documents.”

In line seven, add “in writing” between “expressed” and “by.”

MODIFY § 9.5.1 AS FOLLOWS:

§ 9.5.1 Delete the first sentence of § 9.5.1 and replace it with: “The Architect shall not certify payment and shall withhold a Certificate for Payment in whole or in part to the extent reasonably necessary to protect the Owner.”

ADD THE FOLLOWING SECTION AFTER § 9.6.2.5:

§ 9.6.2.6 The Contractor shall be liable for the entire amount owed to a subcontractor and to pay such subcontractor within 60 days of the receipt of an invoice following satisfactory completion of the work for which the subcontractor has invoiced, even if Contractor has not received payment from Owner for Work performed by the Subcontractor. The Contractor shall not be liable for amounts otherwise reducible due to the subcontractor’s noncompliance with the terms of the contract. However, in the event that the contractor withholds all or a part of the amount invoiced by the subcontractor under the terms of the contract, the contractor shall notify the subcontractor within 50 days of the receipt of such invoice, in writing, of his intention to withhold all or a part of the subcontractor’s payment with the reason for nonpayment, specifically identifying the contractual noncompliance, the dollar amount being withheld, and the lower-tier subcontractor responsible for the contractual noncompliance. Payment by the party contracting with the contractor shall not be a

condition precedent to payment to any lower-tier subcontractor, regardless of that contractor's receiving payment for amounts owed to that contractor.

DELETE § 9.6.7 IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING:

§ 9.6.7 Payment otherwise due hereunder to the Contractor or any Subcontractor shall be withheld until the Contractor has furnished its federal employer identification number to the Owner and the Subcontractors have furnished their federal employer identification numbers to the Contractor and the Contractor has furnished the same to the Owner.

AFTER § 9.7, ADD THE FOLLOWING SECTION:

§ 9.7.1 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or if the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, the Owner shall have a right to offset such amount against the Contract Sum, subject to the disputes provisions of this Agreement, and may elect either to (i) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (ii) issue written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

§ 9.7.2 Interest: Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate of one percent (1%).

ADD THE FOLLOWING AT THE END OF § 9.8.4:

§ 9.8.4 Nothing herein shall authorize the Architect to extend the date for Final Completion of the Work except as authorized in Article 7.

SUPPLEMENT § 9.8.5 BY ADDING THE FOLLOWING:

§ 9.8.5.1 Final payment will follow the semi-final inspection, but only when all of the following have been accomplished:

(a) Action on all Change Orders and claims concluded.

(b) As-Built information furnished to the Architect.

(c) Charts, wiring diagrams, keys, operating manuals, shop drawings, catalog cuts, brochures furnished to the Architect and accepted for transmittal to Owner’s representative.

(d) Necessary bonds, guarantees, warranties, and certificates furnished.

(e) Owner personnel instruction in operation of all equipment and systems completed.

(f) General Contractor’s account settled with the Owner.

(g) Final Change Order issued and Contractor’s final release executed conditioned on final payment.

§ 9.8.5.2 When the Architect is satisfied that all of the above has been accomplished, the Contractor shall submit an itemized final application for payment.

§ 9.8.5.3 The Architect shall issue, if he determines the need, additional instructions, or procedures for affecting the orderly processing of this final inspection and payment phase.

MODIFY § 9.10.4 AS FOLLOWS:

§ 9.10.4 .3 Delete the word "or"

.4 Add "; or" at the end of the clause

.5 Claims arising from facts or circumstances unknown to the Owner at the time final payment is made, such as (by way of example and not in limitation) premature failure of any of the Work as a result of defective materials or labor supplied by, or through, the Contractor.

ADD THE FOLLOWING SUBPARAGRAPHS TO § 9.10:

§ 9.10.6 Neither approval of any progress or final payment nor the issuance of a certificate of Substantial Completion, nor any payment by Owner to Contractor under the Contract Documents, nor any use or occupancy of the Project or any part thereof by Owner, nor any act of acceptance by Owner, nor any failure to do so, nor the failure of Owner to file a Claim as set forth in the Contract Documents, nor any correction of defective Work by Owner, shall constitute an acceptance of Work not in accordance with the Contract Documents nor shall the same relieve the Contractor of responsibility for faulty materials or workmanship or operate to release the Contractor or his surety from any obligation under the Contract, the performance bond or the payment bond.

§ 9.10.7 If, upon receipt of the written notice from the Contractor that any portion of the work is substantially complete, the Architect determines that the Contractor has not conscientiously complied with the above, then the inspection by the Owner and the Architect may be delayed until the Architect determines that the Contractor has complied with the above requirements.

§ 9.10.8 Upon substantial completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof, as provided in the Contract Documents. The Contractor's Application shall be accompanied by the Final Punch List which shall be revised as of the date of the Application to indicate all work which remains incomplete. This revised Final Punch List shall have an accurate dollar value assigned to each item of work. If any items on the Final Punch List are omitted from the revised Final Punch List accompanying the Application, and the Owner or the Architect are not assured that these omitted items have been satisfactorily completed, they shall add such items to the list accompanying the Application and assign dollar values to each item to cover the cost of the work involved. The Architect and Owner shall also adjust the dollar values assigned by the Contractor if, in their reasonable opinion, the Contractor's assignment is insufficient to cover the cost of the work. The total of all final dollar value assignments will be deducted from the Contractor's Application prior to payment by the Owner. After the issuance of Substantial Completion, no payment will become due until all required as-built drawings, maintenance manuals, bonds, guarantees, warranties, certificates, final inspections, fire marshal inspection, mechanical inspection, etc., and the like have been submitted and accepted by the Owner. No subsequent payment will be made until the Final Payment, unless authorized by the Owner. If, in the opinion of the Owner and Architect, the Contractor is diligently pursuing the remaining Work as itemized on the revised Final Punch List, and the Contractor is also correcting with dispatch, defects occurring after the preparation of the Final Punch List, then the Owner may, at its option, authorize payment prior to Final Payment.

§ 9.10.9 At project completion and prior to final payments, the Owner shall be supplied with one (1) full set of marked-up "As-Built Drawings" by the Contractor and all items listed in the "Project Closeout Checklist."

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

SUPPLEMENT § 10.2.3 BY ADDING THE FOLLOWING SENTENCES:

§ 10.2.3 The Contractor shall at all times make all reasonable efforts to protect the Work in progress from damage caused by rain water, ground water, and all other water. He shall provide enclosures, and other equipment required to provide this protection. The Contractor shall provide all shoring, bracing, and sheathing required for safety and proper execution of the Work and shall have the same removed when Work is complete. All shoring, bracing, and sheathing shall be constructed in accordance with accepted engineering procedures and shall meet the requirements of all applicable federal, state and local regulations.

ADD THE FOLLOWING TO § 10.2.4:

§ 10.2.4.1 When the use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary, the Contractor shall give the Owner and Architect reasonable advance notice.

ADD THE FOLLOWING AFTER § 10.2.7:

§ 10.2.7.1 All public ways within or adjacent to the work site shall be maintained by the Contractor in such condition that they may be used freely and safely by the public.

§ 10.2.7.2 If new or existing structures, facilities, utilities, streets, pavements, curbs, walks, or other site improvements are damaged or incorrectly removed through the execution of the Work, they shall be repaired, replaced, or made good by the Contractor to the satisfaction of the Owner, the Architect, utility, or authority of the damaged or removed Work

MODIFY § 10.3.6 AS FOLLOWS.

§ 10.3.6 Add the following "or any subcontractor, sub-subcontractor, material supplier or any other entity for which the Contractor is responsible" between "If, without negligence on the part of the Contractor" and "the Contractor is held liable …."

As modified, § 10.3.6 shall read as follows:

"If, without negligence on the part of the Contractor or any subcontractor, sub-subcontractor, material supplier or any other entity for which the Contractor is responsible, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred."

ARTICLE 11: INSURANCE AND BONDS

DELETE § 11.1.2 AND REPLACE WITH THE FOLLOWING:

§ 11.1.2 Bonds shall be in the form of AIA Document A312-1984 which includes both a Performance Bond and a Payment Bond. The Performance and Payment Bonds shall each be in an amount at least equal to the Contract Sum as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. The bonds shall remain in full force during the Contract term and the Performance Bond shall remain in effect at least until one year after the date when final

payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents.

ADD THE FOLLOWING NEW SUBSECTION, § 11.1.5, TO § 11.1:

§ 11.1.5 Performance and Payment Bonds shall be delivered simultaneously with delivery of the executed Contract.

REPLACE § 11.5.2 WITH THE FOLLOWING:

§ 11.5.2 Prior to settlement of an insured loss, the Insured Party (whether it is the Owner or the Contractor) shall notify the other Party of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The other party shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the other Party does not object, the Insured Party shall settle the loss and the other Party shall be bound by the settlement and allocation. Upon receipt, the Insured Party shall make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Parties shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Party not directly negotiating the settlement timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Insured Party may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

ADD THE FOLLOWING AT THE END OF § 12.1.2:

§ 12.1.2 This provision shall also apply to surveys and tests as well as examinations of completed Work. In any case, costs shall include the cost of professional advice and services necessary to complete examinations, surveys and tests.

ARTICLE 13: MISCELLANEOUS PROVISIONS

DELETE § 13.1 AND REPLACE WITH THE FOLLOWING

§ 13.1 The Contract shall be governed by the laws of the Commonwealth of Virginia, without giving effect to any choice or conflict of law provision or rule (whether of the Commonwealth of Virginia or of another state) that would cause the application of the laws of any jurisdiction other than those of the Commonwealth of Virginia. The parties submit to and agree to not contest the personal jurisdiction and venue of the circuit and general district court of Mecklenburg County, Virginia, for resolution of any and all claims, causes of action, or disputes arising out of or related to this Contract.

SUPPLEMENT § 13.4 BY ADDING THE FOLLOWING:

§ 13.4.7 Notices given to the Architect as required in paragraph § 13.4.1 and § 13.4.2 shall be given at least three (3) days in advance of the date of such tests and shall be confirmed to the Architect in writing.

§ 13.4.8 Owner's Right to Operate Equipment: When the required test of a system or systems has not been successfully completed at the time the Work under the Contract has otherwise been finally

completed, the Contractor shall operate these services when required until the tests have been successfully completed or it shall have given the Owner the right to operate them.

§ 13.4.9 The Architect/Engineer and Owner shall be present at all demonstrations of all equipment and systems; i.e., HVAC, fire alarms, etc. The Owner and Architect/Engineer shall be contacted one (1) week prior to these demonstrations

ADD NEW SECTIONS FOLLOWING § 13.5:

§ 13.6 Waiver

§ 13.6.1 Any failure of the Owner to demand rigid adherence to one or more of this Contract's provisions, on one or more occasions, shall not be construed as a waiver nor deprive the Owner of the right to insist upon strict compliance with the terms of this Contract. Any waiver of a term of this Contract, in whole or in part, must be in writing and signed by the party granting the waiver to be effective.

§ 13.7 Severability

§ 13.7.1 If any provision of this Contract is held to be illegal, invalid, or unenforceable, or is found to be against public policy for any reasons, such provision shall be fully severable and this Contract shall be construed and enforced as if such illegal, invalid, or unenforceable provision had never been part of this Contract, and the remaining provisions of this Contract shall remain in full force and effect and shall not be affected by the illegal, invalid, or unenforceable provision, or by its severance from this Contract.

§ 13.8 Lead Solder Certification

§ 13.8.1 At the completion of the work, the Contractor must submit a written certification that no plumbing or mechanical materials or equipment incorporated into the project contains lead solder.

§ 13.9 Federal Immigration Reform and Control Act of 1986

§ 13.9.1 The Contractor does not, and shall not during the performance of this Contract, knowingly employ an unauthorized alien as defined in the Federal Immigration Reform and Control Act of 1986.

§ 13.10 Ethics in Public Contracting.

§ 13.10.1 The provisions, requirements, and prohibitions pertaining to bidders, offerors, contractors, and subcontractors that are found in Article 6 (Va. Code § 2.2-4367 *et seq.*) of the Virginia Public Procurement Act apply to this Contract.

§ 13.11 Audit

§ 13.11.1 Contractor's records shall be open to inspection and subject to audit and/or reproduction, during normal working hours, by the Owner to the extent necessary to adequately permit evaluation and verification of any invoices, payments or claims submitted by Contractor or any of its payees pursuant to execution of the Contract. Such records subject to examination shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs (including overhead allocations) as they may apply to costs associated with this Contract.

.1 For the purpose of such audits, inspections, examinations and evaluations, the Owner shall have access to said records from the effective date of this Contract, for the duration of the Work, and until five (5) years after the date of final payment by Owner to Contractor pursuant to this Contract.

.2 Owner shall have access to Contractor's facilities, shall have access to all necessary records, and shall be provided adequate and appropriate work space, in order to conduct audits in compliance with this article. Owner shall give Contractor reasonable advance notice of intended audits.

.3 Contractor shall require all Subcontractors, insurance agents, and materials suppliers (payees) to comply with the provision of this article, by insertion of the requirements hereof in a written contract between Contractor and payee. Failure to obtain such written contracts which include such

provisions shall be reason to exclude some or all of the related payees' costs from the amount payable to Contractor pursuant to this Contract.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

MODIFY § 14.1.1 AS FOLLOWS:

§ 14.1.1.1 Add "or" following the semi-colon.

§ 14.1.1.2 Substitute a period for the semi-colon.

DELETE § 14.1.1.3 AND § 14.1.1.4 IN THEIR ENTIRETY

DELETE § 14.1.2, § 14.1.3, AND § 14.1.4 IN THEIR ENTIRETY

DELETE § 14.2.1 AND SUBSTITUTE THE FOLLOWING:

§ 14.2.1 The Owner may terminate the Contract if the Contractor:

.1 institutes proceedings or consent to proceedings requesting relief or arrangement under the Federal Bankruptcy Code or any similar or applicable federal or state law; or if a petition under any federal or state bankruptcy or insolvency law is filed against the Contractor and such petition is not dismissed within sixty (60) days from the date of said filing; or if the Contractor admits in writing, his inability to pay his debts generally as they become due, or if it makes a general assignment for the benefit of his creditors, or if a receiver, liquidator, trustee or assignee is appointed on account of his bankruptcy or insolvency; or if a receiver of all or any substantial portion of the Contractor's properties is appointed;

.2 abandons the Work; or if he fails, except in cases for which an extension of time is provided, to prosecute promptly and diligently the Work or to supply enough properly skilled workmen or proper materials for the Work;

.3 submits an Application for Payment, sworn statement, affidavit or document of any nature whatsoever which is intentionally falsified;

.4 fails to make prompt payment to Subcontractors or for materials or labor or otherwise breaches its obligations under any subcontract with a Subcontractor; or if a materialman's lien or notice of lien is filed against any party of the Work or the site of the Project and not promptly bonded or insured over by the Contractor in a manner satisfactory to the Owner;

.5 disregards any laws, statutes, ordinances, rules, regulations or orders of any governmental body or public or quasi-public authority having jurisdiction of the Work or the site of the Project;

.6 otherwise violates any provision of the Contract Documents; then the Owner, upon the occurrence of the events described in clauses .1 through .5 above, without prejudice to any right or remedy available to the Owner under the Contract Documents or at law or in equity may, after giving the Contractor and his surety under the Performance Bond and under the Labor and Material Payment Bond, if any, seven (7) days' written notice, terminate the employment of the Contractor and, in accordance with the Uniform Commercial Code, may enforce a Security Agreement by taking possession of and using all or any part of the Contractor's materials, equipment, supplies and other property of every kind used by the Contractor in the performance of the Work in the completion of the Work. If requested by the Owner, the Contractor shall remove any part or all of its equipment, machinery and supplies from the site of the Project within seven (7) days from the date of such

request, and in the event of the Contractor's failure to do so, the Owner shall have the right to remove or store such equipment, machinery and supplies at the Contractor's expense. In case of such termination, the Contractor shall not be entitled to receive any further payment for Work performed pursuant to the Contract through the date of termination. The Owner's right to terminate the Contract pursuant to this Subparagraph § 14.2.1 shall be in addition to and not in limitation of any rights or remedies existing hereunder or pursuant hereto or at law or in equity.

MODIFY § 14.2.2 AS FOLLOWS:

§ 14.2.2 In the first sentence, delete "and upon certification by the Architect that sufficient cause exists to justify such action,"

DELETE § 14.2.4 IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING:

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds all costs to the Owner of completing the Work, then the Contractor shall be paid for all Work performed by the Contractor to the date of termination. If such costs to the Owner of completing the Work exceed such unpaid balance, the Contractor shall pay the difference to the Owner upon the Owner's demand. The costs to the Owner of completing the Work shall include, but not be limited to, the cost of any additional architectural, managerial and administrative services required thereby, any costs incurred in retaining another contractor or other subcontractors, any additional interest or fees which the Owner must pay by reason of a delay in completion of the Work, attorneys' fees and expenses and any other damage, costs and expenses the Owner may incur by reason of completing the Work. The amount, if any, to be paid to the Contractor shall be determined by the Architect upon application, in the manner provided in Paragraph 9.4, and this obligation for payment shall survive the termination of the Contract.

DELETE § 14.3.2 IN ITS ENTIRETY:

DELETE § 14.4.1 AND SUBSTITUTE THE FOLLOWING:

§ 14.4.1 Upon written notice to the Contractor and the Architect, the Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the Work and terminate the Contract for its convenience. In such case, the Contractor shall be paid for all Work satisfactorily executed and any expense sustained in performing the Work prior to the effective date of termination, plus reasonable out of pocket termination expenses.

DELETE § 14.4.3 IN ITS ENTIRETY.

ARTICLE 15: CLAIMS AND DISPUTES

MODIFY SUBPARAGRAPH § 15.1.2 AS FOLLOWS:

§ 15.1.2 Delete the words ", 10 years after the date of Substantial Completion of the Work." And replace with "such time period during which the Owner is permitted by law to bring an action on a construction contract."

ADD THE FOLLOWING TO SUBPARAGRAPH § 15.1.4:

§ 15.1.4.1 The Contractor shall continue to prosecute the Work and adhere to the approved Construction Schedule during all disputes or disagreements, except as provided in 14.1 above. No Work shall be delayed or postponed pending resolution of any disputes or disagreements.

DELETE SUBPARAGRAPH § 15.2.1 AND SUBSTITUTE THE FOLLOWING:

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in § 12.2.2 or arising under Sections §§ 10.3, 10.4, and 11.5, shall be referred to the Architect as Initial Decision Maker, unless otherwise indicated in the Contract. Except for those claims excluded by this Section § 15.2.1, a final decision by the Owner shall be required as a condition precedent to litigation of all Claims between the Contractor and Owner or as otherwise provided by Virginia law. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

ADD THE FOLLOWING TO SUBPARAGRAPH § 15.2.2:

§ 15.2.2 Any claim by the Contractor for extension of time shall be evaluated only if the Contractor presents to the Architect and the Owner notice of such claim within twenty one (21) days of the occurrence of the events on which the Contractor makes such claim. The Contractor's failure to present such notice within the stated time period shall be deemed a waiver of any such claim for extension of time based on those events.

ADD THE FOLLOWING TO § 15.2.4:

§ 15.2.4 If there is a surety and there appears to be a possibility of a Contractor's default, the Initial Decision Maker may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

MODIFY § 15.2.5 AS FOLLOWS:

§ 15.2.5 Delete last sentence and substitute the following "The initial decision shall be final but subject to litigation."

DELETE § 15.2.6 AND § 15.2.6.1 IN THEIR ENTIRETY:

DELETE § 15.2.8 IN ITS ENTIRETY:

DELETE § 15.3.1 IN ITS ENTIRETY AND REPLACE IT WITH THE FOLLOWING LANGUAGE:

§ 15.3.1 The parties may agree in writing to handle claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 through non-binding mediation in advance of pursuing legal remedies as outlined in Section 15.4.

DELETE § 15.3.2 IN ITS ENTIRETY AND REPLACE IT WITH THE FOLLOWING LANGAUGE:

§ 15.3.2 If the parties endeavor to resolve their Claims by mediation, they shall select a mediator mutually acceptable to both parties.

DELETE § 15.3.3 IN ITS ENTIRETY

DELETE § 15.4 IN ITS ENTIRETY AND REPLACE IT WITH THE FOLLOWING LANGUAGE:

§ 15.4 ARBITRATION AND LITIGATION
To the extent not already removed by the changes in these Supplementary Conditions, delete all other references to arbitration throughout the A201-2017 Document.

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: South Hill New Police Station.

B. Owner's Name: Town of South Hill, Virginia.

C. Architect's Name: Moseley Inc. of Richmond, VA.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price (Fixed Sum) as described in the Bidding and Contractual Requirements (Division 00) included in this Project Manual.

1.03 PROFESSIONAL SEALS

A. Use of Professional Seals on Bidding, Procurement, and Contract Documents: For the purposes of this paragraph, the term “Regulant” refers to the individual who signs and seals parts of the Contract Documents (e.g. the Drawings and Specifications). Certain information has been excerpted verbatim from a source or sources (e.g., UL assemblies, SMACNA details, applicable state/jurisdiction building code) which was considered or used by Regulant in preparing parts of the Contract Documents, as follows:

1. The excerpted information was neither prepared under the direct control nor personal supervision nor created by the Regulant, as it was prepared by the source and owner of the excerpted information.
2. For purposes of bidding, procuring, and performance of the Work, and in any event of conflicts or ambiguities between the excerpted information in the Contract Documents and the requirements of applicable codes and standards, provide the better quality or greater quantity of Work which, at a minimum, complies with the requirements of the applicable codes and standards.
3. Advise Architect immediately upon becoming aware of requirements of the Work which are not consistent with the requirements of the excerpted information.
4. Attribution is acknowledged for information obtained and included herein verbatim from other source or sources.
5. Regulant has taken into consideration and used certain excerpted information from other sources which are applicable to the Contract Documents, and the Regulant indicates by its seal that it is assuming responsibility for its services in use and application of the excerpted information to the requirements of Work, but not for the excerpted information itself which was prepared by others. Regulant does not indicate by its seal that it is responsible for use or application of other information in such source or sources which was not included herein.

1.04 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1. Maintain routes of egress and life safety systems for Owner and occupants at all times.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Existing building spaces may not be used for storage.

D. Existing building shall be maintained weathertight. Do not modify elements of the existing building except as indicated on the Construction Documents. Repair damage to the existing building due to construction activity.

E. Time Restrictions:
   1. Comply with local regulations for hours of work, noise ordinances, and similar requirements.

F. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the building is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

G. Controlled Substances: The use of alcohol and drugs is not permitted on the Project site. Provide a designated outdoor smoking area for construction personnel that is at least 30 feet away from the building.

1.06 SPECIFICATION SECTIONS APPLICABLE TO ALL WORK

A. The provisions of the Owner/Contractor agreement, General Conditions of the Contract, Supplementary Conditions (if any), and all Division 01 sections shall apply to all sections of the Project Manual.

1.07 SECURITY PROVISIONS

A. Background Check: The Owner requires that a background check be performed on all personnel working on the site. Comply with Owner's requirements for screening service to be used. Maintain a list of all accredited persons, submit a copy to Owner on request.

B. Identification Badges: Provide identification badges to each person authorized to enter premises. Badge shall include personal photograph, name, employer, expiration date, and an assigned number. Have personnel return badges to Contractor after completion of their portion of the Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 011000

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, unless otherwise agreed to by Owner in writing.

B. Forms filled out by hand will not be accepted.

C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

D. Include in each line item, the amount of Allowances specified in this section. For Quantity Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

E. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

F. Revise schedule to list approved Change Orders, with each Application For Payment.
   1. When a Change Order includes multiple PCOs, break down the total Change Order to include each PCO as an individual line item.

1.02 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Balance to Finish.
   9. Retainage.

F. Execute certification by signature of authorized officer.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
   1. When a Change Order includes multiple PCOs, break down the total Change Order to include each PCO as an individual line item.

I. Submit one electronic and three hard-copies of each Application for Payment.

J. Include the following with the application:

1. Transmittal letter as specified for submittals in Section 013000.
2. Construction progress schedule, revised and current as specified in Section 013000.
3. Partial release of liens from major subcontractors and vendors.
4. Affidavits attesting to off-site stored products.

1.03 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor on AIA Document G710 "Architect's Supplemental Instructions."

B. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 14 days, unless otherwise indicated in Proposal Request.

C. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation.

D. For other required changes, Architect will issue a Construction Change Directive, on AIA Document G714, signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.

F. Substantiation of Costs: Provide full information required for evaluation.
   1. Provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

G. Execution of Change Orders: Architect will issue Change Orders on AIA Document G701 for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

1.04 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 017000.

C. Provide evidence and supporting data for the following, as attachments to the Application for Final Payment:
   1. AIA G706, "Contractor's Affidavit of Payment of Debts and Claims."
   2. AIA G706A, "Contractor's Affidavit of Release of Liens."
   3. AIA G707, "Consent of Surety to Final Payment."
   4. Copy of Certificate of Occupancy.
   5. Settlement of all debts and claims, including liquidated damages, taxes, and fees.
   6. Utility meter readings, fuel levels, and similar measurements, as of the date of turn over to the Owner.
   7. Certificates for insured products, and certificate of insurance for completed operations.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012000

SECTION 012100
ALLOWANCES

PART 1 GENERAL

1.01 SUBMITTALS

A. Allowance Proposal: Submit initial proposal for purchase of products and materials, on Change Order form.

B. Supporting Documentation:
   1. Products and Material: Provide invoices and other documents as required, for products and materials indicating quantities, prices, taxes, delivery fees, and other costs.
   2. Labor and Installation: Provide time sheets and other documents as required, indicating all on-site Subcontractor costs, including hours worked, quantity or amount of product/material installed, hourly wages, and Subcontractor overhead and profit.

1.02 LUMP-SUM AND QUANTITY ALLOWANCES

A. Costs Included in Lump-Sum and Quantity Allowances: All Subcontractor's costs: Cost of products and materials, taxes, freight, delivery, receiving and handling, labor and installation, Subcontractor overhead and profit.

B. Costs Not Included in Lump-Sum and Quantity Allowances: All General Contractor's costs: General coordination, GC's overhead and profit.

C. Contractor Responsibilities:
   1. Assist Architect in selection of products.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.

D. Contractor shall return unused products and materials that were purchased under allowance to the manufacturer or supplier, and provide credit to the Owner.

E. At closeout of contract, differences in costs for each allowance will be adjusted by Change Order to increase the contract sum or to provide a credit to the Owner, as applicable.

1.03 LUMP SUM ALLOWANCE SCHEDULE

A. Lump Sum Allowance No. 1: Include the stipulated sum of $6,300.00 for interior and exterior panel signage, as specified in Division 10 Section "Signage."

B. Lump Sum Allowance No. 2: Include the stipulated sum of $20,000.00 for electrical circuit revisions and changes required by the required "Short-Circuit Study," "Protective Device Coordination Study," and "Arc-Flash Hazard Analysis Study" (Sections 260572, 260573, and 260574).

C. Lump Sum Allowance No. 3: Include the stipulated sum of $22,509.94 for security camera system design, furnish, and installation. This Work shall be provided by Owner-assigned Subcontractor, Central Technology Solutions. The Contractor shall be responsible for the work of this Subcontractor and its work just as if the Subcontractor had been selected by the Contractor.

D. Lump Sum Allowance No. 4: Include the stipulated sum of $36,475.00 for access control system design, furnish, and installation. This Work shall be provided by Owner-assigned Subcontractor, Central Technology Solutions. The Contractor shall be responsible for the work

of this Subcontractor and its work just as if the Subcontractor had been selected by the Contractor.

E. Lump Sum Allowance No. 5: Include the stipulated sum of $50,000.00 for hazardous materials abatement.

1.04 QUANTITY ALLOWANCE SCHEDULE

A. Quantity Allowances, General: Coordinate with Division 1 "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.

B. Quantity Allowance No. 1: Include 8,086 square feet of moisture vapor treatment (MVT).

C. Quantity Allowance No. 2: Include 500 cubic yards of excavation of material, below or in addition to the levels indicated in the Contract Documents for this work.

D. Quantity Allowance No. 3: Include 15 cubic yards of excavation of material in trenches and footings, below or in addition to the levels indicated in the Contract Documents for this work.

E. Quantity Allowance No. 4: Include 50 cubic yards of building undercut, below or in addition to the levels indicated in the Contract Documents for this work.

F. Quantity Allowance No. 5: Include 15 cubic yards of excavation of rock in trenches and footings, below or in addition to the levels indicated in the Contract Documents for this work.

G. Quantity Allowance No. 6: Include 500 tons of additional crushed stone, in place, below or in addition to the levels indicated in the Contract Documents for this work.

H. Quantity Allowance No. 7: Include 1,000 linear feet of subsurface drains, including furnish and installation, and trenching and backfill.

I. Quantity Allowance No. 8: Include 300 square feet of brick removal and replacement.

J. Quantity Allowance No. 9: Include 300 square feet of existing mortar repointing.

K. Quantity Allowance No. 10: Include 100 bags of self-leveling underlayment, furnished and installed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012100

SECTION 012200
UNIT PRICES

PART 1 GENERAL

1.01 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.02 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

B. Quantity Allowance: Coordinate with Division 1 Section "Allowances." Where quantity allowances are indicated, the unit prices included in this section shall be used to determine total allowance amount for quantity indicated.

1.03 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated on the Drawings or in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the Drawings or individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified via mutual agreement, and by personnel authorized by Owner, if required.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

E. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes; calculate and certify quantities for payment purposes.

1.04 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.05 SCHEDULE OF UNIT PRICES

A. Unit Price 1: Moisture Vapor Treatment (MVT):
   1. Unit Price shall cover providing a surface-applied moisture vapor treatment, to be applied to concrete slabs prior to installation of floor finishes. Unit price shall be measured by the square foot (sq. ft.).

B. Unit Price 2: Additional Excavation:

1. Unit price shall cover additional excavation below or in addition to the levels required for the work as indicated on the Contract Documents, transportation to off-site disposal, replacement with suitable structural fill material compacted per specifications, and quantity verification by a Surveyor licensed in the Commonwealth of Virginia. Unit price shall be measured in cubic yards (cu. yd.).

C. Unit Price 3: Additional Excavation in Trenches and Footings:
   1. Unit price shall cover additional excavation in trenches and footings below or in addition to the levels required for the work as indicated on the Contract Documents, transportation to off-site disposal, replacement with suitable structural fill material compacted per specifications, and quantity verification by a Surveyor licensed in the Commonwealth of Virginia.. Unit price shall be measured in cubic yards (cu. yd.).

D. Unit Price 4: Building Undercut:
   1. Unit price shall cover building undercut excavation, below or in addition to the levels required for the work as indicated on the Contract Documents, transportation to off-site disposal, and replacement with stone material compacted per specifications, and quantity verification by a Surveyor licensed in the Commonwealth of Virginia. Unit price shall include required bracing/shoring. Unit price shall be measured in cubic yards (cu. yd.).

E. Unit Price 5: Excavation of Rock in Trenches and Footings:
   1. Unit price shall cover additional excavation of rock in trenches and footings below or in addition to the levels required for the work as indicated on the Contract Documents, transportation to off-site disposal, and replacement with stone material compacted per specifications, and quantity verification by a Surveyor licensed in the Commonwealth of Virginia. Unit price shall be measured in cubic yards (cu. yd.).

F. Unit Price 6: Additional Crushed Stone (VDOT #1, #3, and/or #7):
   1. Unit price shall cover additional crushed stone, in place, over properly prepared subgrade, in addition to the levels required for the work as indicated on the Contract Documents. Unit price shall be measured in tons (t.).

G. Unit Price 7: Subsurface Drains, Trench, Install, and Backfill:
   1. Unit price shall cover subsurface drain, including furnishing and installation, and all required trenching and backfill. Unit price shall be measured in linear feet (l.f.).

H. Unit Price 8: Brick Replacement:
   1. Unit price shall cover removal of existing brick and installation of new brick by toothing into existing masonry. Unit price shall be measured in square feet (s.f.).

I. Unit Price 9: Mortar Repointing:
   1. Unit price shall cover repointing of masonry joints including removal of existing mortar to required depth and installation of new mortar. Unit price shall be measured in square feet (s.f.).

J. Unit Price 10: Self-Leveling Underlayment:
   1. Unit price shall cover furnish and install of self-leveling underlayment to provide leveling of existing floor slabs. Unit price shall be measured by the bag (50- or 55-lb).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012200

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control, such as unavailability, regulatory changes, or unobtainable warranty terms.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Substitutions shall be submitted directly by a General Contractor/prime bidder. Substitutions submitted by a subcontractor, manufacturer, supplier or other entity other than General Contractor are not acceptable and shall be rejected.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. A copy of the Substitution Request Form that shall be used is included at the end of this Section for informational purposes. Request a Word or editable PDF version of the form from the Architect and complete the form digitally; do not complete the form by hand.
   2. Contractor's Substitution Request documentation must include the following:
      a. Substitution Request Information:
         1) Indication of whether the substitution is for cause or convenience.
         2) Issue date.

3) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
4) Description of Substitution.
5) Reason why the specified item cannot be provided.
6) Description of how proposed substitution affects other parts of work.

b. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
1) Physical characteristics.
2) In-service performance.
3) Expected durability.
4) Visual effect.
5) Sustainable design features.
6) Warranties.
7) Other salient features and requirements.
8) Include, as appropriate or requested, the following types of documentation:
(a) Product Data:
(b) Samples.
(c) Certificates, test, reports or similar qualification data.
(d) Drawings, when required to show impact on adjacent construction elements.

c. Impact of Substitution: Provide data indicating cost savings to Owner and change in Contract Time due to accepting substitution.

E. Limit each request to a single proposed substitution item.
1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Architect will consider requests for substitutions for convenience only within 30 days after date of Agreement.
1. Substitutions for convenience submitted after this time period may or may not be considered, at the Architect's discretion.

B. Submit request for Substitution for Cause immediately upon discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs engendered by proposed substitution of:
a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
b. Other unanticipated project considerations.

D. Substitutions will not be considered under one or more of the following circumstances:

1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.

3.03 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

3.04 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.05 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

END OF SECTION 012500

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Substitution Request Form – After Receipt of Bids

All Substitution Requests shall be submitted by the Contractor only. Substitution Requests received from subcontractors, sub-subcontractors, manufacturers, vendors, etc., will be "rejected" without review.

General Information				
Project Name	South Hill New Police Station			
A/E Project Number	651033			
Specified Product/Item Information				
Specification Title				
Section				
Page				
Article / Paragraph				
Description				
Proposed Substitution Information				
Proposed Substitution				
Reason for not providing specified product/item				
Comparative Data	Attach a point-by-point comparative data list. Include all differences between the proposed substitution and the specified product/item. If not provided, this Request will be rejected.			
Manufacturer				
Manufacturer Address				
Manufacturer Phone				
Manufacturer Representative Email address				
Trade / Model Name				
Model Number				
Installer				
Installer Address				
Installer Phone				
History	☐ New product	☐ 2-5 years	☐ 5-10 yrs	☐ 10 yrs or longer
Proposed substitution affects other parts of the Work	☐ Yes		☐ No	
If yes, explain				
Savings to Owner for accepting proposed substitution	$			
Proposed substitution affects Contract Time	☐ Yes		☐ No	

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If yes	☐ Add	☐ Deduct
If yes, number of calendar days		
Proposed Substitution Similar Installation		
Have you (this Contractor) used this product/item on any other projects	☐ Yes	☐ No
Project		
Project Address		
Architect/Engineer		
A/E Phone		
Owner		
Owner Phone		
Date installed		

Attached Supporting Data					
☐ Drawings	☐ Product Data/Specs	☐ Samples	☐ Tests	☐ Reports	☐

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Contractor certifies all of the following:
• Contractor shall provide specified product/item in the event this Substitution request is rejected. • Proposed substitution has been fully investigated and determined to be equal or superior in all respects to the specified product, except as may otherwise be specifically and clearly indicated herein. • If applicable, proposed substitution shall not adversely affect LEED requirements nor shall it prevent achieving the relative number of applicable LEED point[s] the specified product would have received. • Proposed substitution's function, appearance, and quality are equal or superior in all respects to the specified product, except as may otherwise be specifically and clearly indicated herein. • Same or superior warranty and/or guarantees shall be furnished for proposed substitution as is required for the specified product/item. • Same maintenance service and source replacement parts, as applicable, are available; including local availability. • Proposed substitution shall have no adverse effect on other trades. • Cost data as stated herein is complete. Claims for additional costs related to the accepted proposed substitution which may subsequently become apparent shall be waived; including licenses, fees, and/or royalties. • Proposed substitution shall not affect dimensions and functional clearances. If the proposed substitution does affect dimensions and/or functional clearances, Contractor shall adjust the Work as required and necessary to accommodate the proposed substitution at no additional cost to the Contract. • Payment shall be made by the Contractor, via a deduct/credit Change Order, for changes to the building design, including A/E fees for the design and detailing, caused by the proposed substitution. • Coordination, installation, and changes to the Work as necessary for the accepted proposed substitution shall be complete in all respects.

Contractor Information	
Submitted by	
Signed By	
Date	
Email address of Signee above	
Company Name	
Address	
Phone	

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Architect / Engineer Review and Action	
Acceptance of this substitution request is an acceptance of only the manufacturer and product/item for general conformance with the design concept reflected in the Contract Documents. The A/E has made no attempt to verify specific performance data, or to check the details of the proposed substitution as to special features, capacities, physical dimensions, or code and/or regulatory compliance, all of which remain the responsibility of the Contractor.	
☐ Proposed Substitution is found to be acceptable for inclusion in Change Order, if approved by Owner – Provide submittals in accordance with Contract Document requirements.	
☐ Proposed Substitution is found to be acceptable as noted for inclusion in Change Order, if approved by Owner - Provide submittals in accordance with Contract Document requirements.	
☐ Proposed Substitution is rejected – Provide specified product/item.	
☐ Proposed Substitution submittal/form not in accordance with Contract Documents (not timely, incomplete)	
Comments / Remarks	
Reviewed by	
Signed By	
Date	

END OF SUBSTITUTION REQUEST FORM

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Electronic File Distribution: Upon request, Contractor may be provided electronic files for use in coordination of the Work and preparation of submittals. Contractor shall submit a signed Request Form for Electronic Files, provided by the Architect.

1. Electronic files do not contain all of the information of the Bid Documents or Contract Documents for construction of the Project, and the Architect shall not be responsible for differences between electronic files, Bid Documents, and Contract Documents.

1.02 SUBMITTALS

A. General Contractor Personnel: Within 15 days after award of Contract, provide a summary of General Contractor's on site personnel. Identify each individual, beginning with project superintendent. List project responsibilities, cell phone number, and email address.

B. Subcontractors: Within 15 days after award of Contract, provide a summary of all companies and individuals engaged as subcontractors for any part of the Project. Include a contact name, company address, phone number, and email address, and identify what part of the Work shall be completed by each subcontractor.

C. Coordination Drawings: Submit completed Coordination Drawings for Architect's information.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.

1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
2. It is Contractor's responsibility to submit documents in allowable format.
3. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
4. Paper document transmittals will not be reviewed unless previously approved; emailed electronic documents will not be reviewed.
5. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: Coordinate method for exchanging files no later than the Preconstruction Meeting. The Architect's Procore service and procedures can be used at no charge. If the Contractor chooses to use a different platform and methodology:
   1. The Architect may reject the methodology or platform proposed and:
      a. use the Architect's Procore service, or
      b. the project team will revert to traditional hard-copy exchange;
   2. or the Contractor shall bear the cost of software, licensing, training, etc., for the project team to participate.

C. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive/record copies of files for Owner. If the Project Team uses an alternate platform preferred by the Contractor, the Contractor shall be responsible for distributing archive/record copies of files to Owner and Architect.

3.02 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
   4. Owner's Commissioning Agent.
   5. Major subcontractors, consultants, and others as necessary and appropriate.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.
   8. Site mobilization and utilization.
   9. Other project-specific items on pre-distributed agenda.

D. Architect shall record minutes and distribute digital copies to Owner, Contractor, and other attendees. Contractor shall be responsible for distribution to subcontractors and other personnel affected by decisions made.

3.03 CONSTRUCTION WASTE MANAGEMENT CONFERENCE

A. Architect will schedule a meeting after Notice of Award. Upon mutual agreement of all parties, the CWM conference may be incorporated as part of the sustainability preconstruction conference above.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
   4. Demolition subcontractor.

5. Major subcontractors, consultants, and others as necessary and appropriate.

C. Agenda:
   1. Waste generated during demolition activities:
      a. Methods for reusing, recycling, and donating materials.
      b. Identification of materials that must be disposed at a landfill.
      c. How to quantify amounts of materials in each category.
   2. Waste generated during construction and renovation activities:
      a. Methods for reusing, recycling, and donating materials.
      b. Identification of materials that must be disposed at a landfill.
      c. How to quantify amounts of materials in each category.
   3. How and where to separate waste on site.
   4. Methods of documenting and reporting for amounts of material reused, recycled, donated, and landfilled.

3.04 INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN DEVELOPMENT SESSION

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Owner's Commissioning Agent.
   3. Architect.
   4. Mechanical engineer.
   5. Contractor.
   6. HVAC subcontractor.
   7. Other major subcontractors, consultants, and others as necessary and appropriate.

C. Agenda:
   1. Protection of Materials: Discussion of how and where materials that could impact IAQ will be stored, including but not limited to, the following:
      a. Insulation.
      b. Gypsum board.
      c. Flooring materials.
      d. Ceiling panels.
      e. Furnishings.
      f. Odorous chemicals.
   2. Protection of HVAC: Discussion of how HVAC equipment will be stored, installed, and operated during construction.
   3. Pathway Interruption: Discussion of how airflow between construction zones will be limited to prevent the spreading of pollutants from one part of the building to another.
   4. Housekeeping: Discussion of how the building will be kept clean and dry.
   5. Materials Installation Scheduling: Discussion of what wet (odor emitting) materials will be used on the project, in order to schedule their installation before fuzzy (odor absorbing) materials.

3.05 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section. Do not allow installation of affected work to proceed until preinstallation meeting can be held.

1. Include all preinstallation meetings on the Project Schedule.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect and Owner in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.06 PROGRESS MEETINGS

A. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor's superintendent.
   4. Other subcontractors or consultants as required for the specific parts of the Work to be discussed.

C. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of RFIs log and status of responses.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Maintenance of quality and work standards.
   11. Effect of proposed changes on progress schedule and coordination.
   12. Other business relating to the work.

D. Architect shall record minutes and distribute copies to the Owner, Contractor, and other consultants, Owner's representatives, or other third party attendees. The Contractor shall be responsible for distributing to any affected subcontractors and other personnel.

3.07 CLOSEOUT MEETING

A. Schedule and administer closeout meeting no later than 90 days before the scheduled Date of Substantial Completion.

B. Make arrangements for the meeting, prepare agenda with copies for participants, and preside at the meeting.

C. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor's superintendent.
   4. Major subcontractors.

5. Other subcontractors or consultants as required.

D. Agenda:
   1. Review closeout requirements and procedures in Division 1 Section "Execution and Closeout Requirements."
   2. Review startup, testing, and adjusting of all systems, including testing/adjusting/balancing (TAB) and Commissioning.
   3. Coordination of inspections by local authorities having jurisdiction and third party Special Inspectors as required to obtain Certificate of Occupancy.
   4. Coordination of Owner's occupancy and changeover of utilities, insurance, and building keying/lock system.
   5. Procedures for Contractor's Correction Punch List, Architect's Substantial Completion inspection, and Final Correction Punch List.
   6. Delivery, turnover, and storage of maintenance materials, attic stock, special tools, and other non-installed materials.
   7. Coordination of closeout documentation, including demonstration and training materials and videos, as built/record documents, operation and maintenance binders, and warranty binders.
   8. Removal of temporary facilities, construction equipment, and tools.
   9. Final cleaning, touchup, restoration, and preventive maintenance.
   10. Coordination of final Applications for Payment.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.08 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
   1. Date.
   2. High and low temperatures, and general weather conditions.
   3. List of subcontractors at Project site.
   4. Approximate count of personnel at Project site.
   5. Major equipment at Project site.
   6. Material deliveries.
   7. Safety, environmental, or industrial relations incidents.
   8. Meetings and significant decisions.
   9. Unusual events (submit a separate special report).
   10. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
   11. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
   12. Testing and/or inspections performed.
   13. Signature of Contractor's authorized representative.

3.09 COORDINATION DRAWINGS AND COORDINATION CONFERENCE

A. Coordination Drawings: The Contractor shall prepare coordination drawings of all spaces where utilities, systems, and other components converge or intersect and efficient installation is required to accommodate all components.
   1. Prepare coordination drawings of the following spaces, at minimum. Supplement with additional spaces as required by project-specific conditions.
      a. Above ceilings.
      b. Vertical chases, shafts, and wall cavities.
      c. Mechanical and electrical rooms, fire pump room, and other major utility spaces.
   2. Provide accurate overall dimensions of components (for example, outside diameters of pipe and conduit, or overall ductwork dimensions including insulation and enclosure thickness).
   3. Include accessory components of systems that could cause potential conflicts, such as bracing, slotted channel framing, hangers, and other supports, valve handles, flanges, fittings, cable/wire management trays, and other similar components.
   4. Include sequence of installation of all components, materials, and systems.
   5. Include means of access to each component, material, or system, for maintenance and repairs.
   6. Provide additional coordination drawings as required by individual specification sections.
   7. Prepare Coordination Drawings using project-specific information. Do not use photocopies or reproductions of Contract Documents, and do not use standard details or data from manufacturers, suppliers, or other outside parties.
   8. Drawing Files: The Contractor may develop coordination drawings using 2D CAD software or with 3D BIM software with clash-detection functionality.
      a. The Architect will furnish original 3D BIM model or 2D DWG files for Contractor's use upon receipt of Architect's "Request Form for Electronic Files". A copy of this form shall be provided to the Contractor upon request.
         1) The Architect makes no guarantee to the accuracy of components in electronic files. The Contractor shall coordinate electronic data with the Contract Documents in order to provide final Coordination Drawings.
         2) If using 2D files, the Contractor shall prepare drawings in multiple views (for example, RCP and section) to fully represent 3D space, for example plenum heights, wall assembly thicknesses, etc.
   9. Submittal: Submit Coordination Drawings as a "Submittal for Information." Architect will not approve Coordination Drawings, but will keep on file for use in subsequent coordination and conflict resolution.

B. Coordination Conference: Schedule and conduct a Coordination Conference prior to beginning construction or rough-in of affected work. Require attendance by all affected trades and installers.
   1. Identify the Coordination Conference as a "milestone" date on the Construction Progress Schedule.
   2. Advise the Architect of all potential conflicts identified in the Coordination Drawings and at the Coordination Conference.
   3. Do not proceed with construction or installation of components, materials, or systems until potential conflicts have been resolved and affected parties have agreed to a remedy.
   4. Remedies to address conflicts not identified in the Coordination Drawings, at the Coordination Conference, or otherwise addressed prior to construction or installation of affected components, materials, and systems, or discovery of a non-workable situation not

identified or addressed, will not be considered as a basis for delay, time extension, or additional cost to the Contract.

3.10 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to Owner.
   3. Prepare using software provided by the Electronic Document Submittal Service.
   4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 016000 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.
   4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response.
      a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.

4. Issue date and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.

G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. When the Architect provides a response to an RFI, that RFI shall be closed. If there is additional information required, or a question about the response itself, then another RFI with a new number shall be generated by the Contractor. At no time shall an RFI be "re-opened" or remain open after the Architect has formally responded.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.11 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Coordinate with Contractor's construction schedule and schedule of values.
2. Format schedule to allow tracking of status of submittals throughout duration of construction.
3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.

a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

b. Account for a reasonable duration of time to allow for final color selections, approvals, and preparation of final finish schedules (one finish schedule for interior color selections, and one for exterior color selections, as applicable). This period shall begin upon receipt of all submittals requiring color selection.

3.12 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Design data.
   3. Shop drawings.
   4. Samples for selection.
   5. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. Color Selection: In individual specification sections, specific items are identified which require color/finish selections to be made by the Architect from color chart or sample submittals. The Submittal Schedule, prepared according to “Submittal Schedule” paragraph above, shall identify these required color/finish submittals.
   1. Submittals requiring color selection must be submitted by Contractor and approved by Architect for conformance with Contract Documents prior to the start of the color selection process. When the submittals have been approved for conformance with Contract Documents, the process for color selection, presentation of color concepts, Owner approval, and Color Schedule preparation will begin.
   2. Interior Color Selections: The Architect will make coordinated selections of colors/finishes for the building interior, present the resulting color concepts to the Owner for approval, and prepare the actual Interior Color Schedule for the Work.
   3. Exterior Color Selections: The Architect will make coordinated selections of colors/finishes for the building exterior and prepare Exterior Color Schedule.

E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below.

3.13 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Certificates.
   2. Test reports.
   3. Inspection reports.
   4. Manufacturer's instructions.
   5. Manufacturer's field reports.
   6. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.14 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

3.15 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Selection Samples: Submit one set of manufacturer's charts indicating full range of available colors, textures, patterns, and other aesthetic qualities.

C. Verification Samples: Submit three sets of physical samples. Two sets will be retained by Architect, the third will be returned to the Contractor. Maintain approved sample at the Project site for use in comparing to installed Work.
   1. Where a full-size assembly of multiple components is required as a sample (for example, railing section or full-size cabinet), only one sample is required for those items.

3.16 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a single transmittal for all submittals required by each individual specification section, unless otherwise indicated.
      a. Verification samples and large shop drawing submittals may be submitted under separate cover when approved by Architect.
   2. Transmit using AIA G810 or other approved form.
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Upload submittals in electronic form to Electronic Document Submittal Service website.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. Allow sufficient time for administrative processing, Architect's initial review, and potential resubmittals.
         1) Large submittals may require longer review durations. Large or multi-part submittals (such as structural steel or aluminum storefront and curtainwall) may be submitted by building area, building level, or otherwise subdivided "packages" with the approval of the Architect. Subdivided "packages" will be

reviewed one at a time in the order received. If large submittals are submitted in their entirety as a single package, the Architect may elect to review and return portions of the submittal individually, and will coordinate the schedule for return of these partial reviews with the Contractor for sequencing in the Work.

b. Allow additional time for submittals requiring sequential reviews involving Architect's consultants, Owner, or another affected party.

c. Allow additional time for submittals requiring sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval.

d. No extensions to the project schedule shall be granted due to delays that can be attributed to submittal processing or failure to allow for sequential reviews or resubmittals.

8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.

9. When revised for resubmission, identify all changes made since previous submission.

10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

11. Incomplete submittals may not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.

12. Submittals not requested will be recognized, and will be returned "Not Reviewed".

B. Product Data Procedures:

1. Submit only information required by individual specification sections.

2. Collect required information into a single submittal.

3. Submit concurrently with related shop drawing submittal.

4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.

2. Do not reproduce Contract Documents to create shop drawings.

3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:

1. Transmit related items together as single package.

2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3. Selection Samples: Provide color charts that accurately relay color, pattern, and texture information. Photographs or photocopies of color charts are unacceptable and subject to rejection.

4. Verification Samples: Provide physical samples of each color selected by Architect from Selection Samples. Verification samples shall be manufactured and prepared identically to the material that shall be used in the installed Work. Label each sample clearly with manufacturer, product name, and color, texture, and/or pattern name as applicable. Photographs of physical samples are unacceptable and subject to rejection.

3.17 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt, but will take no other action.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
   1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Approved as Noted":
         1) Where review notations indicate revisions are necessary, submit corrected item, with review notations acknowledged and incorporated.
   2. Not Authorizing fabrication, delivery, and installation:
      a. "Revise and Resubmit":
         1) Resubmit revised item, with review notations acknowledged and incorporated.
      b. "Rejected/Resubmit":
         1) New submittal required, with item complying with requirements of Contract Documents.
      c. "Color Selection Required":
         1) Color selections for the entire project, or portion thereof, will be provided after receipt of all color charts and samples required for the Project.
      d. "Not Submitted":
         1) Additional submittal items are required that were not provided in the original submittal.

E. Architect's actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Not Reviewed": To notify the Contractor that the submittal has been received for record only.

END OF SECTION 013000

SECTION 013216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit in PDF format.

1.02 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.03 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify work of separate phases and other logically grouped activities.

C. Identify all major milestone dates, including, but not limited to, Notice to Proceed and Substantial and Final Completion dates.

D. Identify duration of each activity, in maximum 15 day intervals.

E. Incorporate work restrictions indicated in Section 011000 - Summary, if any.

F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

G. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

H. Indicate procurement duration and delivery dates for long-lead time items.

I. Coordinate submittal approval process with procurement and delivery requirements. Submittals requiring resubmission or revision for approval will not be allowed as a basis for schedule impacts.

J. Indicate delivery dates for owner-furnished products and products identified under Allowances.

K. Indicate the time period for color selection activity and approval by Owner and Architect, as required per Section 013000 - Administrative Requirements.

L. Indicate date of changeover from temporary to permanent utilities.

M. Indicate time periods for Commissioning activities, equipment startup, and testing and balancing.

N. Provide a reasonable time period prior to the date of Substantial Completion for administrative activities and procedures.

O. Provide legend for symbols and abbreviations used.

3.03 NETWORK ANALYSIS (CPM)

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
   1. Preceding and following event numbers.
   2. Activity description.
   3. Estimated duration of activity, in maximum 15 day intervals.
   4. Earliest start date.
   5. Earliest finish date.
   6. Actual start date.
   7. Actual finish date.
   8. Latest start date.
   9. Latest finish date.
   10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
   11. Percentage of activity completed.
   12. Responsibility.

D. Analysis Program: Capable of accepting revised completion dates, and recomputation of all dates and float.

E. Required Reports: List activities in sorts or groups:
   1. By preceding work item or event number from lowest to highest.
   2. By amount of float, then in order of early start.
   3. In order of latest allowable finish dates.
   4. Listing of activities on the critical path.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Schedule revisions shall not modify any Contract Dates or the Contract Sum, unless specifically approved and documented via Change Order.

G. Submit reports required to support recommended changes.

H. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

I. Recovery Schedule: If the Contractor is 14 or more days behind schedule, in the opinion of the Owner, the Contractor shall prepare a Recovery Schedule, incorporating a reasonable, mutually agreed upon length of time to return the Work to the approved Schedule. The Recovery Schedule shall be prepared to the same level of detail as the original construction progress schedule. Submit the recovery schedule for Owner review; do not proceed until the Owner has approved.

   1. At the end of the recovery period, Owner shall reevaluate construction progress and determine if the Recovery Schedule has been successfully completed. If completed, Owner shall direct the Contractor to proceed with the latest approved Construction Schedule.
      a. If the Contractor is still behind schedule at the end of the recovery period, the Owner shall direct the Contractor to provide additional schedule revisions to complete the recovery, or may at its option pursue other means of resolution as provided for by the Contract Documents.
   2. Need for and preparation of a Recovery Plan shall not be the basis of additional cost to the Owner or extension of Project Schedule, unless the Contractor can demonstrate that the reason for being behind schedule is no fault of their own.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION 013216

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 DEFINITIONS

A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

B. Contractor's Professional Design Services/Delegated Design: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.

1. Design Services Types Required:

a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor’s sole responsibilities for construction means, methods, techniques, sequences, and procedures.

b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.02 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:

1. Temporary sheeting, shoring, or supports.
2. Temporary scaffolding.
3. Temporary bracing.
4. Temporary falsework for support of spanning or arched structures.
5. Temporary foundation underpinning.
6. Temporary stairs or steps required for construction access only.
7. Temporary hoist(s) and rigging.
8. Investigation of soil conditions and design of temporary foundations to support construction equipment.
9. Additional temporary controls as required.

1.03 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

1. Submit a Request for Information to Architect if the criteria indicated are not sufficient to perform required design services.

C. Scope of Design Services/Delegated Design: As required by individual specification sections.

1.04 SUBMITTALS

A. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.
      b. Professional licensure information.
      c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
   1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
   2. Include required product data and shop drawings.
   3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
   4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

C. Test Reports: After each test/inspection, require testing agency to promptly distribute digital copy of report to Architect, Owner, Contractor, and others as required.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports:
   1. Submit report promptly to Architect for information.

2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Qualification Statement: Provide documentation showing testing laboratory is accredited under OSHA's Nationally Recognized Testing Laboratory (NRTL) program or through the National Institute of Standards and Technology's (NIST's) National Voluntary Laboratory Accreditation Program (NVLAP).

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Contractor's Quality Control (CQC) Plan:
   1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
      a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
         1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
      b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
         1) Management and control of documents and records relating to quality.
         2) Communications.
         3) Coordination procedures.
         4) Resource management.
         5) Process control.
         6) Inspection and testing procedures and scheduling, including inspections by authorities having jurisdiction and special inspections.
         7) Control of noncomplying work.
         8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
         9) Control of testing and measuring equipment.
         10) Project materials certification.
         11) Managerial continuity and flexibility.
      c. Acceptance of the plan is required prior to start of construction activities not including mobilization work. Owner's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.

1.06 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, comply with the higher quality or quantity, and provide documentation of the conflict to the Architect.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform Special Inspections and other specified testing indicated in individual specification sections.

B. Where indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency: Testing agency shall comply with requirements of ASTM E 329, and shall be certified through OSHA's Nationally Recognized Testing Laboratory (NRTL) program or through the National Institute of Standards and Technology's (NIST's) National Voluntary Laboratory Accreditation Program (NVLAP).

1. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mockups: Construct integrated exterior mockups as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

E. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

F. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
   2. Make corrections as necessary until Architect's approval is issued.

G. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

H. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties for Contractor-Employed Testing and Inspection Agencies:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Attend preconstruction meetings and progress meetings.
   8. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   7. Coordinate repairs where testing and inspection has damaged the Work.

E. Re-testing and/or re-inspections required because of non-compliance with specified requirements shall be performed by the same agency. Do not proceed with construction activities that would conceal or cover work needing re-testing or re-inspection.

F. Re-testing and/or re-inspections required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, and field quality control requirements as applicable, and to initiate instructions when necessary.

B. Provide a written report of observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions or Contract Documents. Obtain Owner's approval prior to proceeding with any modifications.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. Contractor may request to restore defective Work or portions of the Work to comply with specified requirements in lieu of replacement. Obtain Owner's approval prior to proceeding with restoration.

C. If, in the opinion of Owner, it is not practical to restore or remove and replace the work, Owner will direct an appropriate remedy or adjust payment.

END OF SECTION 014000

Moseley

Statement of Special Inspections

Project Number and Name	#651033 South Hill New Police Station
Location	111 East Danville Street, South Hill, VA 23970
Permit Application	Keli Reekes, Town Manager
Applicant's Address	211 South Mecklenburg Avenue, South Hill, VA 23970
Permit Number	TBD
Architect of Record	Moseley
Structural Engineer of Record	Moseley

- This statement of special inspections is submitted as a condition for permit issuance in accordance with Section 1704.3 of the 2021 International Building Code. It includes a schedule of special inspections applicable to this project as well as the name of the special inspector and the identity of other testing laboratories or agencies intended to be retained for conducting these inspections.
- The special inspector shall keep records of all inspections, shall furnish inspection reports to the code official and to the structural engineer or architect of record. All discrepancies discovered shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the code official, structural engineer, and/or architect of record. Interim reports shall be submitted to the code official, owner, and structural engineer and/or architect of record.
- A final report of special inspections documenting completion of all required special inspections and correction of discrepancies noted in the interim reports shall be submitted upon completion of the inspections.
- Jobsite safety is solely the responsibility of the contractor. Materials and activities to be inspected do not include the contractor's equipment and methods used to erect or install the materials listed.

Prepared By: MOSELEY INC.

Signature: Jeffrey S. O'Beirne

Printed Name: JEFFREY S. O'BEIRNE

COMMONWEALTH OF VIRGINIA
Jeffrey S. O'Beirne
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/19/26
PROFESSIONAL ENGINEER

APPLICANT'S AUTHORIZATION

Signature: Keli Reekes

Date: 10/19/2026

BUILDING OFFICIAL'S ACCEPTANCE

Signature: _____

Date: _____

SECTION 014200
DEFINITIONS AND REFERENCE STANDARDS

PART 1 GENERAL

1.01 SUMMARY

A. The definitions include in this section supplement, but do not replace, the definitions contained in the General Conditions. In the event of duplication, the General Conditions shall govern.

B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Furnish: To supply, deliver, unload, and inspect for damage.

B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

D. Provide: To furnish and install.

E. Supply: Same as Furnish.

F. Installer: A Contractor or other entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that specified requirements apply exclusively to tradespeople of the corresponding generic name.

G. Experienced: When used with the term "Installer," this term means having successfully completed previous work similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with the requirements of local authorities having jurisdiction.

H. Replace: Provide an acceptable like product or material in place of a missing or unacceptable (rejected) product or material. To "replace" an unacceptable product or material includes its removal and disposal.

I. Punch List: A written list of unfinished Work and defective Work resulting from inspection and testing to determine whether Substantial Completion has been accomplished. The unfinished Work and defective Work must be finished and corrected to obtain Substantial or Final Completion, in accordance with the General Conditions.

J. Written or Printed: When used in conjunction with manufacturer's product data or installation requirements, either of these terms may be used to require compliance with manufacturer's current printed and published information.

1.03 REFERENCE STANDARDS

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified, or are required by applicable codes or local authorities having jurisdiction.

B. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 014200

SECTION 014520 - TESTING, ADJUSTING, AND BALANCING (TAB)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Balancing Air Systems:
   a. Variable-air-volume systems.

2. Testing, Adjusting, and Balancing Equipment:

   a. Motors.
   b. Heat-transfer coils.

3. Control system verification.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including sub-mains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. TAB Agent: The entity responsible for performing and reporting the TAB procedures.

M. AABC: Associated Air Balance Council.

N. AMCA: Air Movement and Control Association.

O. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days of the Contractor's Notice to Proceed, submit evidence that the TAB Agent and this Project's TAB team members meet the qualifications indicated in the "Quality Assurance" Article below.

B. Warranty: Submit warranties indicated below.

C. Special Guarantee: Submit Special guarantee indicated below

D. Contract Documents Examination Report: Within 60 days of the Contractor's Notice to Proceed, submit the Contract Documents review report as indicated in Part 3 below.

E. Strategies and Procedures Plan: Within 90 days of the Contractor's Notice to Proceed, submit the TAB strategies and step-by-step procedures as indicated in Part 3 below. Include a complete set of report forms intended for use on this Project.

F. Testing Adjusting and Balancing Conference Notification: Within 120 days of the Contractor's Notice to Proceed, submit the testing adjusting and balancing conference notification. The notification shall include the date, time and location of the conference as well as a list of attendees.

G. TAB Conference Minutes: Within 180 days of the Contractor's Notice to Proceed, submit the TAB conference minutes. Minutes shall include a list of attendees and a record of the discussions and decisions made during the conference.

H. System Readiness Reports: 60 days prior to substantial completion the contractor performing work under section "Building Automation System" (BAS) shall complete pre-commissioning checklists. The contractor performing work under this section shall, as part of the system readiness report, witness pre-commissioning activities and shall initial each element on the pre-commissioning checklist. The system readiness report shall be completed and submitted as specified. Do not include the checklists as they will be submitted under section "BAS".

I. Certified TAB Reports: Within 60 days of substantial completion submit the testing and balancing reports prepared, as indicated in this Section, on approved forms certified by the TAB Agent.

1. Balancing report.

1.5 QUALITY ASSURANCE

A. Agent Qualifications: Agent and agent's representatives shall be certified by either AABC or NEBB. The testing and balancing agent shall be one of the following:

1. Atlantic Testing, Balancing and Commissioning
3229 Anderson Highway, Suite 200
Powhatan, VA 23139
757.638.4861

2. C&W Tesco, Inc.
430 Southlake Boulevard, Suite B-12
Richmond, VA 23236
804.379.9345

3. Mechanical Systems Testing and Balancing, Inc. (MSTB)
7314 Impala Drive
Richmond, Virginia 23228
804.264.0454

4. Testing Specialties, Inc.
PO Box 2788
Chesapeake, VA 23327
757.436.2345

B. Testing and Balancing Agents not listed shall be permitted to bid. The following information shall be submitted as part of the Quality Assurance Submittal:

1. Provide evidence of satisfactory completion of at least two projects of similar size and scope. Submit the following for each project:

a. Completed testing and balancing reports for each project.
b. If not included in the testing and balancing report, provide equipment startup checklists for each project.
c. Owner contact for each project.
d. Design engineer contact for each project.
e. Architect contact for each project.

2. The architect shall determine whether the agent is qualified and the decision shall be final. Re-submittals on behalf of the same company shall not be considered.

C. TAB Conference: Meet with the Owner's and the Architect's representatives on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Set meeting and submit TAB Conference Notification.

1. Minimum Agenda:

a. Submittal distribution requirements.
b. Contract documents examination report.
c. TAB plan.
d. Work schedule and project site access requirements.
e. Coordination and cooperation of trades and subcontractors.
f. Coordination of documentation and communication flow.

D. TAB Reports: Use standard forms from AABC's "National Standards for TAB" or NEBB's "Procedural Standards for TAB of Environmental Systems."

E. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for TAB of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.6 COORDINATION

A. Coordinate the efforts of work performed under other sections for operation of systems and equipment to support and assist TAB activities.

B. Notice: Provide 7 days' advance notice to the contractor and Moseley Architects for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 WARRANTY

A. General Warranty: The national project performance guarantee indicated in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Guarantee: Provide a guarantee on NEBB or AABC forms stating that NEBB or AABC will assist in completing the requirements of the Contract Documents if the TAB Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are hereby required by the Contract Documents.

2. Verify that quantities and locations of devices proposed by the contractor and indicated on the Contract Documents are accessible and appropriate for effective balancing and efficient system and equipment operation.

3. Verify flow rates specified and compare to central equipment capacities.

4. Identify discontinuities and omissions in the Contract Documents.

5. Provide a detailed Testing and Balancing plan within six weeks of the Notice to Proceed.

6. Provide a TAB technician to work at the direction of the CxA for up to 40 hours to assist in testing.

7. Record configuration, set up, parameters, etc, that change during the testing period.

8. Respond to Warranty issues. Record configuration, set up, parameters, etc, that change during the warranty period.

B. Examine BAS submittal data prior to submission and provide comments to contractor, and Moseley Architects.

C. Examine submittal data of HVAC systems and equipment prior to submission and provide comments to contractor, and Moseley Architects.

D. Examine project record documents and provide comments to contractor, and Moseley Architects.

E. Examine Architect's design data, including HVAC system descriptions, statements of design, assumptions for environmental conditions, control drawings, and statements concerning systems and equipment.

F. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

G. Examine system and equipment installations to verify that they are complete and that TAB, and cleaning indicated has been performed.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment is ready for operation, including functioning controls.

K. Examine terminal units, such as fan coil units, to verify that they are accessible and their controls are connected and functioning.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine equipment for installation and for properly operating safety interlocks and controls.

N. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in mixing boxes and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected.
5. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to design values.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

    a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
    b. Duct systems are complete with terminals installed.
    c. Volume and fire dampers are open and functional.
    d. Clean filters are installed.
    e. Fans are operating, free of vibration, and rotating in correct direction.
    f. Variable-frequency controllers' startup is complete and safeties are verified.
    g. Automatic temperature-control systems are operational.
    h. Ceilings are installed.
    i. Windows and doors are installed.
    j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards or NEBB's "Procedural Standards for TAB of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:

1. Verify that the system static pressure sensor is located 2/3 of the distance down the duct from the fan discharge.
2. Verify that the system is under static pressure control.
3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control setpoint so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows

    a. Adjust controls so that terminal is calling for maximum airflow (note some controllers require starting with minimum airflow. Verify calibration procedure for specific project).
    b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
    c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
    d. Adjust controls so that terminal is calling for minimum airflow.
    e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
    f. When in full cooling or full heating, ensure that there is no mixing of hot deck and cold deck airstreams unless so designed.
    g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.

5. After all terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.

    a. Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.
    b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
    c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.

d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

6. Measure fan static pressures as follows:

a. Measure static pressure directly at the fan outlet or through the flexible connection.
b. Measure static pressure directly at the fan inlet or through the flexible connection.
c. Measure static pressure across each component that makes up the air-handling system.
d. Report any artificial loading of filters at the time static pressures are measured.

7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
b. Verify all terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure setpoint to the most energy-efficient setpoint to maintain the optimum system static pressure. Record setpoint and give to controls contractor.
9. Verify final system conditions as follows:

a. Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
b. Re-measure and confirm total airflow is within design.
c. Re-measure all final fan operating data, rpms, volts, amps, static profile.
d. Mark all final settings.
e. Test system in economizer mode. Verify proper operation and adjust, if necessary. Measure and record all operating data.
f. Verify tracking between supply and return fans.

3.6 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating if high-efficiency motor.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass to prove proper operation. Record observations, including controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

B. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.

3.8 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with air and water flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or non-grounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.9 TOLERANCES

A. Set system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans: 0 to plus 10 percent.
2. Air Outlets: minus 10 percent to plus 10 percent.
3. Return Inlets: minus 10 percent to plus 10 percent.
4. Exhaust Inlets: 0 to plus 10 percent.
5. Unless indicated otherwise: minus 10 percent to plus 10 percent.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: When 50% of the construction contract period has elapsed, the contractor performing work under this section shall visit the site twice per month thereafter. After each site visit for each system being tested and balanced, prepare a report to describe completed work, work in progress, and work at variance with the contract documents. Include a list of deficiencies and problems found in each system. Prepare a separate report for each system and each building floor for systems serving multiple floors. Submit the report to the contractor and architect. The contractor shall be responsible for ensuring that deficiencies are corrected. Deficiencies shall remain on the list permanently, shall be issued with each report, and shall be checked off only when they are corrected.

3.11 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB Agent.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Contractor's name and address.
7. Report date.
8. Signature of TAB Agent who certifies the report.
9. Table of contents.
10. Operating sequences that vary from the Contract Documents.
11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type, and size.
13. Notes to explain why certain final data in the body of reports varies from design values.
14. Test conditions for fans and pump performance forms, including:
    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings, including:
        1) Percentage of maximum pitch or diameter.
        2) Maximum RPM.
        3) Minimum RPM on VAV systems.
    e. Settings for supply-air static-pressure controllers on VAV systems.
    f. System operating parameters/conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and water distribution systems. Provide single-line diagrams including the following:

1. Quantities of outside, supply, return, exhaust, and water flow rates.
2. Duct outlet, and inlet sizes.
3. Pipe sizes and locations.
4. Indicated Terminal unit(s): Information & location(s).
5. Indicated Balancing station(s): Information & location(s).
6. Indicated Meter(s): Information & location(s).

F. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.

b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.

G. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch.
f. Make and model number.
g. Face area in square feet.
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

    a. Airflow rate in cfm.
    b. Average face velocity in fpm.
    c. Air pressure drop in inches wg.
    d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
    e. Return-air, wet- and dry-bulb temperatures in deg F.
    f. Entering-air, wet- and dry-bulb temperatures in deg F.
    g. Leaving-air, wet- and dry-bulb temperatures in deg F.
    h. Water flow rate in gpm.
    i. Water pressure differential in feet of head or psig.
    j. Entering-water temperature in deg F.
    k. Leaving-water temperature in deg F.
    l. Refrigerant expansion valve and refrigerant types.
    m. Refrigerant suction pressure in psig.
    n. Refrigerant suction temperature in deg F.
    o. Inlet steam pressure in psig.

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

    a. System identification.
    b. Location.
    c. Coil identification.
    d. Capacity in Btu/h.
    e. Number of stages.
    f. Connected volts, phase, and hertz.
    g. Rated amperage.
    h. Airflow rate in cfm.
    i. Face area in square feet.
    j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

    a. Heat output in Btu/h.
    b. Airflow rate in cfm.
    c. Air velocity in fpm.
    d. Entering-air temperature in deg F.
    e. Leaving-air temperature in deg F.
    f. Voltage at each connection.
    g. Amperage for each phase.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.

c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

J. Test Reports:

1. All equipment test reports.
2. Duct Traverse Reports.
3. Terminal-Device Reports.
4. Coil Reports.
5. Instrument Calibration Reports.

3.12 ADDITIONAL TESTS

A. When requested, provide up to two 32 hours, by the technician that provided services under this section to support commissioning.

B. Within 90 days of completing work performed under this section, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION 230593

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls, in compliance with local authority having jurisdiction.

B. Maintain temporary facilities in operable condition.

1.02 TEMPORARY UTILITIES

A. Owner will provide the following, without metering: Contractor shall be responsible for connection to existing facilities.
   1. Electrical power, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

B. New permanent facilities may be used, with prior Owner authorization.
   1. Use of permanent facilities shall not impact specified warranties. Equipment shall be maintained during temporary usage.

C. Temporary Lighting: Provide temporary lighting of type and producing lighting levels necessary for proper installation of the Work.

D. Temporary Heating, Cooling, and Ventilation: Provide temporary measures and equipment as required for curing, drying, and humidity control. Comply with manufacturer's installation instructions for specific product requirements.
   1. Provide measures and equipment to meet warranty requirements of interior woodwork specified in Division 6 and/or Division 12 sections.
   2. Use of Permanent HVAC Facilities and Equipment: Use of HVAC equipment shall be subject to Owner approval.
      a. Protect new and existing HVAC equipment from intrusion of dust, silica, dirt and debris during construction operations.
      b. Cover all openings in new and existing inactive ductwork during construction operation with minimum 6 mil polyethylene sheet.
      c. Where use of existing HVAC equipment is approved by Owner, provide temporary filters with a minimum MERV of 8. Change the filters every two weeks while construction is ongoing. Provide new filters at Substantial Completion; do not change out temporary filter until approved by Architect.
      d. Do not perform testing and balancing of HVAC equipment until dust, silica, dirt and debris producing activities are complete.

E. Temporary Sewer and Drainage: Comply with requirements of local authority having jurisdiction for connection of temporary sewer to public system.

1.03 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:
   1. Telephone Service: Contractor shall ensure that all of its forces, including on-site managers/supervisors of each Subcontractor, have mobile devices and adequate voice and data coverage for on-site operations.

2. Internet Connections: Contractor shall ensure that all of its forces have access to high speed internet connection with wireless capability; wireless network shall support Internet speed tests in excess of 5 Mbps symmetrical (up/down).

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
   1. Provide temporary unisex toilet units and all required disposable supplies.
   2. Provide handwash stations and hand sanitizer at each toilet unit.
   3. Provide regular servicing of portable facilities by professional servicing company; including draining, cleaning, and disinfecting.

B. New permanent facilities may not be used during construction operations.

C. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building, and for emergency egress.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

A. Construction: Commercial grade chain link fence.
   1. Contractor may provide either fixed or portable fencing to suit conditions. For portable fencing, provide concrete or galvanized steel bases for supporting posts. Bases for portable fencing shall not obstruct sidewalks or other pathways used by pedestrians.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

C. Unless otherwise indicated, provide chain link fencing to enclose entire site area, to include Contractor's field office and laydown/storage areas, areas of the site actively in construction, and as deemed necessary by Contractor.

1.07 EXTERIOR ENCLOSURES

A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 INTERIOR ENCLOSURES

A. Provide temporary partitions to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and gypsum board sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.09 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
   1. Contractor shall repair damage to existing facilities caused by Construction operations.

B. Coordinate with Owner's security program.

C. Environmental Protection: Comply with EPA, OSHA and other regulatory requirements to prevent contamination of site, air, and public sewer/runoff.
   1. Provide additional work restrictions and protective measures as indicated on Civil/Site Drawings and as specified in Section 011000 - Summary.

1.10 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Designated existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

G. Provide watering trucks, mulch, chemical stabilizers, or other control measures, complying with environmental protection requirements, to prevent airborne dust and silica from becoming a nuisance or health issue to Contractor personnel, neighboring properties, and the public.

1.11 WASTE REMOVAL

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 PROJECT IDENTIFICATION

A. Project signs are not part of the Contract.
   1. The Contractor may, at their option and expense, elect to provide Project identification signs. Proposed signs shall comply with layout and details indicated on Drawings, and shall be submitted for Owner approval. Unauthorized signs are not permitted.

B. Provide project identification sign of design and construction indicated on drawings.
   1. Obtain and pay for any permits required for temporary signage by local authority having jurisdiction.

C. Erect on site at location(s) established by Architect.

D. Provide temporary directional signage as directed to facilitate site access for visitors and other construction personnel.

E. No other signs are allowed without Owner permission except those required by law.

1.13 FIELD OFFICES

A. Field Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture and drawing display table.
   1. Provide space for Project meetings, with table and chairs to accommodate 10 persons.
   2. Provide drinking water/water cooler and a private bathroom.
   3. Maintain the following materials in the field office, available to Architect and Owner's representative at all times:
      a. A complete, up-to-date set of all Contract Documents, including FCs, RFIs, PCOs, and COs.
      b. A complete, up-to-date set of all reviewed final shop drawings.
      c. The most recent, up-to-date version of Contractor's Progress Schedule.

B. Locate offices a minimum distance of 30 feet from other structures.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove temporary underground installations.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

2.01 MATERIALS

A. Rough Carpentry: 2x lumber, in length and depth required for floor to ceiling partitions. Partitions shall not be fastened to existing ceilings or flooring to remain. Provide additional bracing and concealed attachments to building structure.

B. Gypsum Board: 1/2-inch gypsum wallboard; ASTM C 1396.

C. Insulation: Mineral-wool fiber blankets; with maximum flame-spread and smoke-developed ratings of 25 and 50 when tested per ASTM E 84.

D. Polyethylene Sheet: Minimum 10 mil reinforced sheeting; achieving a passing rating when tested per NFPA 701, and a maximum flame-spread rating of 15 when tested per ASTM E 84.

E. Walk-Off Mats: Dust-, dirt- and silica-control walk-off mats at each entrance into the enclosed construction area and each entrance through temporary partitions.

F. Hardware: Provide temporary hinges, latch, and lock at doors in temporary partitions. Where doors in temporary partitions are also indicated to serve as egress, provide ADA-compliant exit device and closer.

2.02 EQUIPMENT

A. Fire Extinguishers: Provide portable UL rated extinguishers. Provide extinguisher types rated for potential classes of fire expected for construction work indicated.

PART 3 EXECUTION

3.01 ELEVATOR AND STAIR USAGE

A. Use of new or existing elevator(s) is not permitted.

B. Use of existing stairs is permitted. Cover existing finishes and maintain stairs without damage. Clean and restore stairs to Owner's approval at Substantial Completion.

C. Use of new stairs is permitted. To prevent wear on finishes, do not install finishes on stairs until construction foot traffic can be minimized. Clean and prepare stair substrate thoroughly prior to installation of finishes. Cover finishes after installation, and clean and restore to Owner's approval at Substantial Completion.

1. Provide temporary stairs until new stairs are available.

3.02 PEST CONTROL

A. Provide pest-control services at regular intervals, performed in compliance with regulations of state regulations, and by a pest-control firm licensed in the state where the project is located. Any chemicals and pesticides used shall be approved by EPA and local authority having jurisdiction. Contractor's pest control plan shall ensure the facility is free of termites, roaches, rodents, and other pests at time of Substantial Completion.

1. Coordinate with Owner's Integrated Pest Management (IPM) plan where applicable.
2. Provide Owner with a minimum 72 hours pre-notification for pest-control treatments.

3.03 TEMPORARY FIRE PROTECTION

A. Comply with International Fire Code, Chapter 33 "Fire Safety During Construction and Demolition" for preventing damage to structures under construction.

1. Comply with NFPA 241 "Standard for Safeguarding Construction, Alteration, and Demolition Operations" for additional provisions and conditions that are not covered by Chapter 33 of the International Fire Code.

B. Provide a fire-prevention program, review with all personnel on site, and post fire-prevention information in clearly visible area. Coordinate fire-prevention program with local fire department.

C. Provide clearly labeled portable fire extinguishers.

D. Provide fire watch in compliance with OSHA requirements during and after use of all potential ignition sources, including but not limited to, welders, grinders, cutting torches, heating and electrical equipment, and lighting.

E. Do not allow smoking in areas under construction.

3.04 MOISTURE CONTROL

A. Prevent the absorption of moisture and humidity by:

1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
3. Provide sufficient ventilation for drying within reasonable time frame.

B. Prior to building dry-in, store porous materials in a separate enclosed storage building. Keep all surfaces clear of standing water, and cover or otherwise protect all materials from water infiltration and damage. Do not enclose interior spaces until dry-in is complete and ventilation can remove excess moisture.

C. After building dry-in, provide temporary mechanical ventilation for humidity and moisture control until the building HVAC system is operational. Do not store or install material in the building until ambient temperature and humidity is within manufacturer's acceptable range. Do not install

wet materials, and ensure that substrates are fully dry prior to installing other materials over them.

D. Provide continuous monitoring of installed materials. Remove gypsum board, wood products, and other mold-supporting products, if they become and remain wet for 48 hours. Remove and replace any materials showing visible signs of mold or mildew.

3.05 TEMPORARY FACILITY USAGE AND REMOVAL

A. Maintenance and Usage: Keep temporary facilities clean and in well-maintained condition for the duration of the Project. Prevent misuse of or damage to facilities by construction personnel. Make repairs to temporary facilities or replace facilities as required to keep them in good operating condition and in compliance with applicable OSHA, local permitting, and other applicable regulations.

B. Changeover: Coordinate changeover from temporary facilities to permanent facilities at Substantial Completion, unless an alternate arrangement for changeover has been agreed upon in writing by Owner.

1. Contractor shall be responsible for repair, restoration, and cleaning of permanent facilities that are used for construction purposes after changeover.

C. Removal: Unless otherwise indicated, temporary facilities and controls are the property of the Contractor, and shall be removed upon Architect's approval when Contractor can demonstrate that they are no longer needed.

1. Comply with construction waste management and recycling requirements for temporary facilities and materials that are not able to be reused.
2. After removal of temporary facilities and controls, complete all permanent construction that was not accessible due to the presence of temporary facilities.
3. Remove materials that have become soiled or contaminated due to construction vehicle traffic, parking, temporary field offices, oil or other chemical spillage, and other temporary usage, and replace with clean material. Complete grading, landscaping, paving, and other site improvements, and repair or restore all damage to existing or previously completed site improvements.

END OF SECTION 015000

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 DEFINITIONS

A. Comparable Product: An unnamed product that is similar in quality and performance to named product(s).

B. Basis-of-Design Product: A specific product selected by the Architect for use in the design process; based on certain performance characteristics, physical qualities or details, a specialized finish type, pattern, or color, or other indicated characteristics.

1.02 WARRANTIES

A. Product warranties shall be provided in addition to and run concurrently to Contractor's general warranty/guarantee.
   1. Unless otherwise indicated, all warranty terms shall start on the date of Substantial Completion.

B. Manufacturer's Warranty: A standard warranty issued by the product manufacturer, covering production and material defects.

C. Special Warranties: Warranties in addition to standard manufacturer's warranty, covering fabrication, installation, or specific performance items such as weathertightness

D. Warranty Form: Warranty shall be provided on either manufacturer's standard form or on specified form. When a sample warranty form is not included in the Project Manual, the warranty shall be on mutually agreed form.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Refer to Section 014000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's.
   2. Containing lead, cadmium, or asbestos.

2.03 PRODUCT OPTIONS

A. Products Specified with a Single Named Product: Where required by Owner due to facility standards, provide the named product; no options or substitutions allowed.

B. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

C. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

E. Products Specified by Naming One or More Manufacturers with a Provision for Comparable Products: Unnamed comparable product may be submitted after award of Contract. Comply with requirements in "Comparable Products" article below.

2.04 BASIS-OF-DESIGN PRODUCTS

A. Where a product is specified by naming a Basis-of-Design, comply with the following:
   1. Where a list of additional manufacturers is provided, provide the Basis-of-Design product or a comparable product by one of the listed manufacturers, in compliance with "Comparable Products" article below.
   2. Where a list of additional manufacturers is not provided, provide the Basis-of-Design product, or submit a substitution request in compliance with Section 012500 - Substitution Procedures.
   3. Basis-of-Design characteristics shall include requirements in the Specifications and on the Drawings.
   4. Where the Basis-of-Design lists a specific finish, manufacturers wishing to submit as a Comparable Product or as a substitution shall certify that they are able to provide an exact match to the specified finish, or that they will provide a custom finish to match.

2.05 COMPARABLE PRODUCTS

A. Where a product is specified with a provision for comparable products, Contractors submitting a Comparable Product shall comply with the following:
   1. The submitted product shall not require changes to the Work, unless specifically approved by Architect. If changes are required, the Contractor shall resubmit the product as a substitution request, and the Contractor shall bear the cost of the changes, coordinate with other impacted contractors, and provide appropriate notations on record documents.
   2. Contractor shall provide, with the submittal, a detailed breakdown comparing the submitted product to at least one of the other listed products; list specified performance qualities, test results, dimensions, finish, and other critical properties.
   3. Contractor shall provide warranty data indicating that submitted Comparable Product complies with indicated warranty term(s).

B. Comparable product submittals are subject to Architect's final approval. If a proposed product is found to be unacceptable, Contractor shall revert to one of the named products.

2.06 COLOR/FINISH OPTIONS

A. Preselected Color/Finish: Where a specific manufacturer's premium or custom finish or color is indicated as the basis-of-design, other listed manufacturers shall certify that they can provide an exact match, or that they will provide pricing under the assumption that a custom finish or color will be required.

B. Color/Finish Selection: Unless specifically indicated to either be a custom color or to be selected from manufacturer's standard range, color and finish selections shall be made from manufacturer's full range of options, including premiums, metallics, wood grains, etc.

2.07 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to location designated by Owner; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. Refer to Section 012500 - Substitution Procedures.

3.02 OWNER-FURNISHED PRODUCTS

A. Owner-Furnished/Contractor-Installed Products: Refer to Section 011000 - Summary and to the Drawings for identification of Owner-furnished products for installation by Contractor. Products shall be identified as "Owner-furnished" or "OF/CI".
   1. Owner's Responsibilities for Owner-Furnished/Contractor-Installed Products:
      a. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
      b. Arrange and pay for product delivery to site.
      c. On delivery, inspect products jointly with Contractor.
      d. Submit claims for transportation damage and replace damaged, defective, or deficient items.
      e. Arrange for manufacturers' warranties, inspections, and service.
   2. Contractor's Responsibilities for Owner-Furnished/Contractor-Installed Products:
      a. Review Owner reviewed shop drawings, product data, and samples.
      b. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
      c. Handle, store, install and finish products.
      d. Repair or replace items damaged after receipt.

B. Owner-Furnished/Owner-Installed Products: Where products are indicated on Drawings as "NIC", "Owner-provided", or "OF/OI", the Owner shall furnish and install the indicated products. Coordinate with Owner for expected delivery dates.
   1. The Contractor shall allow for access by Owner's personnel or designated installer as necessary.
   2. The Contractor shall not be responsible for damage to in-place construction caused during delivery/installation of Owner-Provided products.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. Refer to Section 017419.

1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Provide off-site storage and protection when site does not permit on-site storage or protection.

I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

J. Comply with manufacturer's warranty conditions, if any.

K. Do not store products directly on the ground.

L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

M. Prevent contact with material that may cause corrosion, discoloration, or staining.

N. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

O. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 016000

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SUBMITTALS

A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.

B. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.02 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.03 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Perform dewatering activities, as required, for the duration of the project.

E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

F. Dust and Silica Control: Execute work by methods to minimize raising dust and silica from construction operations. Provide positive means to prevent air-borne dust and silica from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust and silica that is generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

I. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

K. Hazardous Materials: Do not use materials or products that contain hazardous substances, for permanently installed products and materials, installation materials, or for cleaning or other construction use.

1.04 COORDINATION

A. See Section 011000 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

G. Utilize recognized engineering survey practices.

H. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

J. Periodically verify layouts by same means.

K. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Fire Safety: Comply with provisions of current version of the International Fire Code, Chapter 33; "Fire Safety During Construction and Demolition" for preventing damage to structures under construction.
   1. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Remove miscellaneous hangers, exposed nails not serving as fasteners, and similar protrusions; remove adhesive residue and tape; fill anchorage holes; and otherwise patch and restore surface to be a uniform substrate.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; prepare substrate per manufacturer's requirements for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. See Section 011000 for other limitations on outages and required notifications.
      c. Provide temporary connections as required to maintain existing systems in service.

3. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
      a. Use cutting methods such as sawing, drilling, and grinding that do not create impact stresses on existing construction. Do not use striking methods such as chopping or hammering.
   3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
   2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.

J. Clean existing systems and equipment in all spaces impacted by alteration work.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

3.06 CUTTING AND PATCHING

A. Refer to Alterations article above for additional requirements related to cutting and patching of existing construction.

B. Perform cutting and patching to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to specified condition.

D. Employ skilled and experienced installer to perform cutting and patching.

E. Restore work with new products in accordance with requirements of Contract Documents.

F. Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material to maintain existing fire ratings, to full thickness of the penetrated element.

H. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust and silica.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Prohibit traffic from landscaped areas.

I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP AND ADJUSTING

A. Coordinate with requirements of Section 019113 - General Commissioning Requirements.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Architect and Owner seven days prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Adjust operating products and equipment to ensure smooth and unhindered operation.

J. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. See Section 017900 - Demonstration and Training.

3.11 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Replace filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Prior to Substantial Completion, complete the following:
   1. Provide startup, testing, and adjusting of all systems and equipment.
      a. Demonstrate that air and water systems are balanced and that automatic temperature control system is in control of all equipment. This may require separate demonstrations if controls cannot be tested for applicable seasons of the year.
      b. Submit written certification that testing/adjusting/balancing operations have been completed, and that systems are operation and under control in conformance with applicable specification section(s).
      c. Submit written certification that all Building Commissioning has been completed.
      d. Complete testing of the electronic security and detention systems and equipment, demonstrating security control.

2. Provide all inspections required by local authorities having jurisdiction to obtain Certificate of Occupancy, and provide written certification of completion of Special Inspections.
3. Provide preventive maintenance services for all equipment used prior to Substantial Completion, and provide initial maintenance servicing for all products and equipment that will be subject to ongoing maintenance/service contracts.
4. Provide final cleaning of all products, materials, and equipment, and provide touch up and restoration of exposed materials and finishes.
5. Provide fresh batteries in all battery-powered products and equipment.
6. Provide demonstration and training for Owner's personnel on all required systems and equipment.
7. Coordinate a walkthrough with the Owner and the local fire department and other emergency services.
8. To the maximum extent possible, remove temporary facilities and controls, construction equipment and tools, and similar items that are not part of the finished Work.
9. Coordinate changeover with the Owner of permanent utilities, insurance requirements, and building's permanent keying and lock system.

B. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

C. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

D. Conduct Substantial Completion inspection with representatives of Owner and Architect, and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
   1. At the Architect's sole discretion, based on the amount of outstanding work, the Architect may elect to decline to issue a Certificate of Substantial Completion and will provide a list of outstanding items that are required to obtain Substantial Completion. The Contractor shall request reinspection after the indicated items have been completed.

E. Upon approval, the Architect shall prepare and distribute Certificate of Substantial Completion, and will include a list of outstanding items and Final Correction Punch List.

F. The Owner will occupy the building after Substantial Completion, as specified in Section 011000.

G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

I. Prior to final completion, complete the following:
   1. Ensure that the Certificate of Substantial Completion is fully executed by all required parties.
   2. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.
   3. Provide final pest and rodent control treatments and inspections.
   4. Remove any remaining construction equipment, tools, and materials; perform additional cleaning required due to construction activities following Substantial Completion, and leave the site prepared for Owner occupancy.
   5. Submit final demonstration and training materials and videos, as built/record documents, operation and maintenance binders, and warranty binders.

6. Submit final application for payment.

3.13 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.
   1. Contractor's maintenance responsibility shall be through Substantial Completion, unless a longer term is required by individual specification section.

B. Maintenance service shall not be assigned or transferred to any agent or third party without prior written consent of the Owner.

END OF SECTION 017000

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.
   1. Fire Safety: Comply with International Fire Code, Chapter 33 "Fire Safety During Construction and Demolition" and with NFPA 241 for provisions relating to accumulation and removal of combustible debris and waste.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled and Salvaged Materials: Include the following information for each:

a. Identification of material, including those retrieved by installer for use on other projects.
b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to Contractor's site superintendent, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.

3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Coordinate with Division 2 demolition contractor to properly identify and separate recyclables. Store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Recycling of Existing Carpet: Remove carpet; cut sheet carpet to 4 foot widths, tightly roll, and pack in container. Palletize carpet tiles on 36 inch or smaller pallets; maximum 4 foot high. Tightly bind or shrink wrap packaged carpeting. Include carpet padding where applicable.
   1. Coordinate with Division 2 demolition contractor.
   2. Coordinate with Division 9 carpet installer to include waste and scrap from new carpet work as applicable.
   3. Refer to Carpet America Recovery Effort (CARE) guidelines and ship or deliver carpet to a designated reclamation/recycling facility. https://carpetrecovery.org/

I. Recycling of Existing Acoustical Ceiling Panels: Verify with ACP manufacturer that existing ceiling tiles can be recycled. Following verification, remove and stack ceiling tiles on pallets and wrap or band the pallet loads for pick up or delivery per recycler guidelines.
   1. Coordinate with Division 2 demolition contractor.
   2. Coordinate with Division 9 ACP manufacturer's recycling program; contact recycler when there is a full trailer load or approx. 30,000 square feet of removed ceiling. Coordinate with recycler to arrange pick up from the project site and transport to recycling facility at no cost.
   3. If quantity to be recycled is less than 30,000 square feet, coordinate with ACP manufacturer for delivery to a consolidation point/facility at Contractor's cost.

J. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

K. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 017419

SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SUBMITTALS

A. Project Record Documents: Submit documents to Architect within 15 days after the date of Substantial Completion.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within 15 days after acceptance.
   2. Submit one PDF draft copy of completed documents within 15 days after the Closeout Conference. This copy will be reviewed and returned, with Architect comments. Revise content of all document sets as required prior to final submission.
   3. After revisions are complete, submit one bound hard copy and PDF electronic file of revised final documents in final form within 15 days after Substantial Completion.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 15 days after acceptance.
   2. Make other submittals within 15 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 15 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.
   4. Miscellaneous record submittals.

B. Ensure entries are complete and accurate, enabling future reference by Owner.
   1. Include revised Drawings reissued during Bidding and Construction.

C. Store record documents separate from documents used for construction.
   1. Keep record documents in a location accessible to Architect for periodic review and reference.
   2. Maintain in legible condition. If record document set becomes damaged or excessively dirty, transfer comments to clean set prior to submittal to Architect.

D. Record information concurrent with construction progress.

E. Record Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

F. Miscellaneous Record Submittals: Where other specification sections require completion certifications, or closeout or record submittals, submit in a single binder organized by specification section.

3.02 ASSEMBLY OF RECORD DOCUMENTS

A. Submittal for Architect's Review:
1. Submit PDF scanned copy of marked up prints.
2. Architect shall review and provide comment on completeness

B. Submittal for Distribution to Owner:
1. After Architect has approved for content and completeness, submit PDF scanned copy of final marked up prints, and submit hard copy originals.
2. Submit full set of Drawings, regardless of whether any modification or markings are on each sheet.

3.03 OPERATION AND MAINTENANCE DATA

A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.04 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.05 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.

2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.06 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder on front and spine with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.

3.07 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 15 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Retain warranties and bonds until time specified for submittal.

D. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

E. Cover: Identify each binder on front and spine with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

F. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

G. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

H. Provide photocopy of each warranty in operation and maintenance manuals; locate each warranty with applicable O&M data for product or equipment.

END OF SECTION 017800

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products, systems, equipment, and other items where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance of products, systems, equipment, and as otherwise indicated in specific specification sections.

1.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit not less than four weeks prior to start of training.
   2. Revise and resubmit until acceptable.
   3. Provide an overall schedule showing all training sessions.
   4. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such as slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.
   3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: DVD Disc.
   2. Label each disc and container with session identification and date.
   3. Where available, provide manufacturer's pre-produced training videos in conjunction with live demonstration and training video.

1.03 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Instructor shall be certified by the manufacturer or fabricator of system.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable, and if acceptable to Owner.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Complete demonstrations within two weeks after the date of Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Complete demonstrations within two weeks after the date of Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site, utilizing installed products and equipment, unless otherwise indicated.

B. Provide training in minimum two hour segments.

C. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

D. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   2. Typical uses of the O&M manuals.

E. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.

4. Discuss cleaning products and procedures, including recommended cleaning products and products that are detrimental to equipment operation or finishes.
5. Provide hands-on training on all operational modes possible and preventive maintenance.
6. Emphasize safe and proper operating requirements; discuss relevant health and safety issues, warning or error indications, and emergency procedures and shutdown.
7. Discuss common troubleshooting problems and solutions. Include minor adjustments for resolving noise, vibration, and improving system efficiency.
8. Discuss any peculiarities of equipment installation or operation.
9. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage. Include discussion of continuing maintenance agreements and procedures.
10. Review recommended tools and spare parts inventory suggestions of manufacturers.
11. Review spare parts and tools required to be furnished by Contractor.
12. Review spare parts suppliers and sources and procurement procedures.

F. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 017900

SECTION 018119
INDOOR AIR QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Provide Indoor Air Quality (IAQ) Management Plan to remain in force during the construction period.

B. Chapter 3 of the Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) IAQ Guideline for Occupied Buildings Under Construction, 2nd Edition 2007, available from SMACNA (703-803-2980 or www.smacna.org).

1.02 SUBMITTAL

A. Construction Indoor Air Quality Management Plan (CIAQM Plan).

PART 2 OBJECTIVES DURING CONSTRUCTION

2.01 PROTECTION

A. Store all materials and equipment in a protected area (inside warehouse or storage trailer). Protect materials and equipment that are too large or heavy to store in a trailer from water and dirt/dust/debris.
   1. OPTION: When stored outside, provide two layers of minimum 8-mil poly on the ground and elevate equipment or material a minimum of 4 inches to allow water to run off. Secure top and sides with two layers of 8-mil poly to prevent water penetration and dust/dirt accumulation.

B. Protect HVAC equipment from dust and odors. Do not store equipment in areas near painting, pressure washing, or excavation. Do not operate equipment during cutting or grinding of masonry or concrete.
   1. Refer to Division 23 for construction filter requirements for protection of mechanical duct systems during construction.
   2. Clean ductwork when installed. Cap ends with poly during construction to prevent contamination.
   3. Do not operate HVAC system until the exterior walls, roof, glass, doors and building filters are properly installed.
   4. If air handlers must be used during construction, provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 at each air-handling unit. Provide specified prefilters and final filters for operation during construction or install temporary 4-inch MERV 8 filters at each return air grille for operation during construction.
   5. Replace all filtration media immediately prior to Substantial Completion.
      a. Filtration media installed in air-handling units shall have a Minimum Efficiency Reporting Value (MERV) of 8.
   6. Do not perform Testing and Balancing until dust or odor generating activities are completed.

2.02 SOURCE CONTROL

A. Minimize IAQ contaminants introduced by construction materials.

B. Store waste construction materials a minimum of 30 feet away from the building.

C. Do not smoke within 30 feet of the exterior building perimeter.

2.03 PATHWAY INTERRUPTION

A. Provide barriers to contain construction areas to allow a portion of the building to be cleaned and then operate the HVAC system in that cleaned area. Acceptable barriers include dust curtains and temporary walls.
   1. Protect areas of the building in which HVAC is operational by physical barriers from areas of the building not acceptable for operation of the HVAC system.

B. Maintain areas within 30 feet of outdoor air intakes free of dust, dirt, debris, and volatile materials while the HVAC system is in operation.

2.04 HOUSEKEEPING

A. As dust accumulates at the Site, it can become airborne when disturbed by nearby activity. Similarly, spills or excess applications of products containing solvents will increase odors at the Site. Leaving the Site wet or damp for more than a day could result in the growth of mold and bacteria. Therefore, Site cleanup and maintenance is important to maintaining good IAQ during construction.

B. Perform the following to control contaminants at the Site:
   1. Suppress dust with wetting agents or sweeping compounds.
   2. Provide an efficient dust collection method (e.g. a damp rag, wet mop, or vacuum equipped with a high efficiency particulate arrester (HEPA) filter or wet scrubber).
   3. Remove spills or excess applications of solvent-containing products immediately. Provide low-VOC emitting spot removers and cleaning agents near occupied areas.
   4. Remove accumulated water and keep work areas as dry as possible, including the use of dehumidification, if necessary.
   5. Once building is enclosed, vacuum with HEPA filtered vacuum cleaners to prevent settled dust from becoming airborne again.
   6. Protect porous materials from exposure to moisture. Replace items that remain damp for more than four hours.

END OF SECTION 018119

SECTION 018317
EXTERIOR BUILDING ENCLOSURE AIR BARRIER REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This section includes administrative and procedural requirements for accomplishing an airtight building enclosure that controls infiltration or exfiltration of air, including but may not be limited to:
   1. The airtight components of the building enclosure and the joints, junctures and transitions between materials, products, and assemblies forming the air-tightness of the exterior building enclosure shall be “the air barrier system.”
   2. Coordinate between trades, schedule and sequence the Work, and provide preconstruction meetings, inspections, tests, and related actions.
   3. Reports performed by Contractor, independent agencies, and governing authorities.
   4. Construct the building enclosure with a continuous air barrier system to control air leakage into (infiltration) and out of (exfiltration) conditioned spaces. The air barrier system shall have the following characteristics:
      a. Continuous, with all joints sealed.
      b. Structurally supported to withstand positive and negative air pressures applied to the building enclosure.
      c. Connections between:
         1) Foundation and walls.
         2) Walls and windows and doors.
         3) Different wall systems.
         4) Wall and roof.
         5) Walls, floors, and roofs across construction joints, control joints and expansion joints.
         6) Walls, floors and roofs to utility, pipe and duct penetrations.
   5. Make all penetrations of the air barrier membrane or system and paths of air infiltration / exfiltration air-tight.

1.02 RESPONSIBILITIES

A. Contractor responsibilities:
   1. Coordinate affected trades and sequence construction to ensure continuity of the air barrier system, joints, junctures, and transitions between materials and assemblies of materials and products, from substructure to walls to roof.
      a. Coordinate the sequence of activities to accommodate required services with a minimum of delay.
      b. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
   2. Provide quality assurance procedures, testing and verification as required.
      a. Schedule times for inspections, tests, taking samples, and similar activities.
   3. Facilitate inspections, tests, and other quality-control services required.
      a. Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested.
      b. Notify the agency sufficiently in advance of operations to permit assignment of personnel.

c. Services include, but are not limited to, the following:
   1) Provide access to the Work.
   2) Furnish incidental labor and facilities necessary to facilitate inspections and tests.
   3) Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
   4) Deliver samples to testing laboratories.
   5) Provide security and protection of samples and test equipment at the Project Site.

4. Organize pre-installation conference and preconstruction meetings between the trades involved in the whole building's air barrier system to discuss where each trade begins and ends and the responsibility and sequence of installation of all the air-tight joints, junctures, and transitions between materials, products and assemblies of products specified in the different sections, to be installed by the different trades.
5. Provide mockup of exterior wall assembly as required.
6. Coordinate the Work and trades to provide an airtight building enclosure.
   a. Continuity of the air barrier materials and products with joints to provide assemblies.
   b. Continuity of all exterior enclosure assemblies with joints and transition materials to provide an exterior enclosure air barrier system.
   c. Specific quality-control requirements for individual construction activities are also indicated in other applicable sections of the specifications. Ensure each subcontractor is adequately and satisfactorily performing the quality assurance documentation, tests and procedures required by each such section.
   d. Inspections, tests, and related actions do not limit Contractor`s quality-control procedures that facilitate compliance with Contract Document requirements.
   e. Requirements to provide an airtight exterior building enclosure is not limited by quality-control services performed by Architect, Owner, or authorities having jurisdiction and are not limited by provisions of this section.

1.03 PERFORMANCE REQUIREMENTS

A. Materials: Used for the air barrier system in the opaque envelope shall have an air permeance not to exceed 0.004 cfm/ft2 under a pressure differential of 0.3 in. water (1.57psf) (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178.

B. Assemblies of materials and components: Shall have an air permeance not to exceed 0.04 cfm/ft2p under a pressure differential of 0.3 in. water (1.57psf) (0.15 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2357.

1.04 SUBMITTALS

A. Submit a written report of each inspection, test, or similar service performed by the air barrier manufacturer's technical representative, to the Owner, Architect, and Contractor.
   1. Report Data: Written reports of each inspection, test, or similar service shall include, but may not be limited to, the following:
      a. Date of issue.
      b. Project title and number.
      c. Name, address, and telephone number of testing agency.
      d. Dates and locations of samples and tests or inspections.
      e. Names of individuals making the inspection or test.
      f. Designation of the Work and test method.
      g. Identification of product and Specification Section.

h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION

A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protect the Work, regardless of the assignment of responsibility for inspection, testing, or similar services.

AIR BARRIER SYSTEM PRE-INSTALLATION CONFERENCE GUIDE

PURPOSE:

Few building construction components require the coordinated activities of more different trades on the construction, design, and management teams than an air barrier system. Once an air barrier has been covered, any remedies for problems with the components or installation can be costly and time-consuming.

Contractor and subcontractors must have a working knowledge of the air barrier installation, proper sequencing, and must work toward a common goal. Through the use of the integrated mockup panel and this Pre-Installation Conference Guide, gaining such knowledge should be enhanced.

Source: Much of this checklist utilizes content from Tremco's "*Air Barrier Project Management – Pre-Construction Meeting Checklist"* document.

Contractor may request an electronic version of this document for editing purposes and for your use.

Send a copy of this guide to the affected trades and/or attendees so they can attend the Conference prepared to discuss these topics and to fill in as much of this information as possible prior to the meeting, or be prepared to fill them in at the meeting.

CHECKLIST:

Submit and/or complete the following prior to conducting the Pre-Installation Conference. Confirm any additional submittal requirements with the relevant specification sections. Check those items below that you have completed or received "Approved" submittals from the Architect. Delete those that do not apply.

____ Product data	____ Shop drawings	____ Product Certificates
____ Product test reports	____ Installer qualifications	____ Samples
____ Compatibility docs	____ Integrated mockup	____ Quality Assurance Program
____ ABAA certifications	____ Warranty sample	____ _____

____ Air Barrier System Subcontractor reviewed submittals of other indicated/specified trade(s)

MANDATORY ATTENDEES:

Attendance by the following parties and affected trades is mandatory. Identify and ensure any other trades or parties involved or affected by the installation of the air barrier system components are also present. Check those below who actually attend the meeting. Delete those that do not apply.

____ Owner and/or Owner's representative
____ Owner's Testing Agency (if hired to inspect ABS)
____ Air barrier installer / subcontractor
____ Air barrier manufacturer's technical representative
____ Window opening subcontractor
____ Exterior Insulation subcontractor
____ Exterior Metal Panel subcontractor
____ Steel frame (hollow metal) subcontractor
____ _____
____ Architect
____ Contractor
____ Masonry subcontractor
____ Roofing subcontractor
____ Sheathing subcontractor
____ Concrete subcontractor
____ CFSF-S subcontractor
____ Waterproofing subcontractor
____ _____

REVIEW OF RELEVANT PROJECT CONTRACT SPECIFICATION SECTIONS:

Review the Contract Specifications and identify and note any modifications that may be necessary, so all parties understand what is required of them. Submit any modifications via appropriate supplemental documents (FC or PCO). Edit specification sections below to match those of this Project.

SPEC SECTION	MODIFICATIONS (IF ANY)
018317	

REVIEW OF RELEVANT PROJECT CONTRACT DRAWINGS:

Review the Contract Drawings and identify and note any modifications that may be necessary, so all parties understand what is required of them. Submit any modifications via appropriate supplemental documents (FC or PCO).

PROJECT CONTRACT DRAWING OR DETAIL NUMBER	MODIFICATIONS (IF ANY)

REVIEW OF RELEVANT PROJECT SHOP / SUBMITTAL DRAWINGS:

Review the submittals and identify and note any modifications that may be necessary, so all parties understand what is required of them. Resubmit those submittals that have not been approved by the Architect.

PROJECT SUBMITTAL / SHOP DRAWING REFERENCE	MODIFICATIONS (IF ANY)

REVIEW OF PRODUCTS:

Review the type of air barrier system that will be provided on the Project and identify each component. Delete those that do not apply.

COMPONENT	ACTUAL PRODUCT TO BE PROVIDED FOR PROJECT
SPF INSULATION – FIELD OF WALL	
SPF INSULATION (WALL) – VOIDS / CRACKS / SHIMS	
SPF INSULATION – FIELD OF ROOF	
FLUID-APPLIED MEMBRANE – PERMEABLE - WALL	
FLUID-APPLIED MEMBRANE – IMPERMEABLE -WALL	
SELF-ADHERED MEMBRANE – PERMEABLE - WALL	
SELF-ADHERED MEMBRANE – IMPERMEABLE -WALL	
SELF-ADHERED MEMBRANE – PERMEABLE - ROOF	
SELF-ADHERED MEMBRANE – IMPERMEABLE -ROOF	
TRANSITION MEMBRANE – SELF-ADHERED	
PRIMER	
MASTIC / TERMINATION SEALANT	

CONSTRUCTION TIE-IN RESPONSIBILITY:

Air barrier systems are successful when a full building envelope/enclosure – without penetrations, voids, holes, gaps, and cracks – is complete. This is critical when numerous trades are involved in the tying-in of the air barrier system to all facets of the exterior building envelope. Utilize the table below to ensure everyone knows who is responsible for the indicated tie-in.

TIE-IN AREA	SUBCONTRACTOR RESPONSIBLE FOR TIE-IN
EXTERIOR FOOTING TO EXTERIOR FOUNDATION WALL	
EXTERIOR FOUNDATION TO EXTERIOR WALL	
SLAB-ON-GRADE TO WALL (EXTERIOR AND INTERIOR)	
SLAB-ON-GRADE JOINTS	
SLAB-ON-GRADE PENETRATIONS	
EXTERIOR WALL TO STEEL FRAME/HOLLOW METAL (E.G., DOORS AND WINDOWS)	
EXTERIOR WALLS TO ALUMINUM FRAMES (E.G., WINDOWS AND LOUVERS)	
DIFFERENT EXTERIOR WALL SYSTEMS (E.G., MASONRY TO METAL)	
EXTERIOR HEAD-OF-WALL TO SLOPING ROOF	
PARAPET WALLS TO ROOF	
EXTERIOR WALL JOINTS	
EXTERIOR SHELF ANGLES	
EXTERIOR STEEL LINTELS	
EXTERIOR WALL PENETRATIONS (E.G., PIPES, DUCTS)	
ROOF PENETRATIONS	
ROOF PERIMETER	

COMPATIBILITY REVIEW:

Each trade/installer shall identify materials that may have potential compatibility issues. For example, some membranes may be subject to decomposing when placed in contact with other materials or components, especially sealants and primers; or may deteriorate if left exposed to the elements and are not protected. Delete those trades/installers that do not apply to this Project.

TRADE / INSTALLER	ISSUES / RESOLUTIONS
AIR BARRIER	
WINDOW	
STEEL FRAME (HOLLOW METAL)	
CFSF-S	
EXTERIOR METAL PANELS	
WATERPROOFING	
MASONRY	
ROOFING	
SHEATHING	
CONCRETE	
INSULATION	
FLEXIBLE FLASHING	
METAL FLASHING	
STRUCTURAL STEEL	

SUBSTRATE PRIMER CONSIDERATIONS:

Indicate whether the substrate for the air barrier material requires the use of a primer, and if so, identify the actual product to be used on the Project. Delete those that do not apply.

SUBSTRATE	YES	NO	PRODUCT
CMU			
SHEATHING			
CONCRETE			
PRECAST			
METAL PANELS			
ROOF SUBSTRATE BOARD			
FLEXIBLE FLASHING			
METAL FLASHING			
WATERPROOFING			
STEEL FRAME / HOLLOW METAL			
STRUCTURAL STEEL			

SUBSTRATE PREPARATION CONSIDERATIONS:

Indicate whether the substrate for the air barrier material requires special treatment or preparation (e.g., flush joints in CMU), and if so, identify the method to be used on the Project. Delete those that do not apply.

SUBSTRATE	YES	NO	METHOD / PROCEDURE	SUBCONTRACTOR RESPONSIBLE
CMU				
SHEATHING				
CONCRETE				
PRECAST				
METAL PANELS				
ROOF SUBSTRATE BOARD				
WINDOW FRAMES				
FLEXIBLE FLASHING				
METAL FLASHING				
WATERPROOFING				
STEEL FRAME / HOLLOW METAL				
STRUCTURAL STEEL				

JOINT CONSIDERATIONS:

It is critical for all joints, gaps, voids, cracks, seams, etc. to be sealed/closed for the air barrier to function properly (based on air barrier manufacturer's instructions). If applicable, indicate the method to be used to close the joints and who is responsible. Delete those that do not apply.

TYPE OF JOINT	METHOD USED TO CLOSE JOINT	SUBCONTRACTOR RESPONSIBLE
CMU		
SHEATHING		
CONCRETE		
PRECAST		
METAL PANELS		
ROOF SUBSTRATE BOARD		
WINDOW FRAMES		
STEEL (HOLLOW METAL) FRAMES		
HEAD-OF-WALL		
OMITTED CMU BLOCK		

INSTALLATION TEMPERATURES:

A major factor in contributing to a successful air barrier system installation is to monitor and install the components within the proper temperature ranges and weather conditions. Indicate below the proper temperature range for each component; the procedure for maintaining the proper temperature range; and the party responsible for maintaining the proper temperature range in accordance with the requirements. Delete those that do not apply.

COMPONENT	PROPER TEMPERATURE RANGE	PROCEDURE AND SUBCONTRACTOR RESPONSIBLE
SPF INSULATION – FIELD OF WALL		
SPF INSULATION (WALL) – VOIDS / CRACKS / SHIMS		
SPF INSULATION – FIELD OF ROOF		
FLUID-APPLIED MEMBRANE – PERMEABLE - WALL		
FLUID-APPLIED MEMBRANE – IMPERMEABLE -WALL		
SELF-ADHERED MEMBRANE – PERMEABLE - WALL		
SELF-ADHERED MEMBRANE – IMPERMEABLE -WALL		
SELF-ADHERED MEMBRANE – PERMEABLE - ROOF		
SELF-ADHERED MEMBRANE – IMPERMEABLE -ROOF		
TRANSITION MEMBRANE – SELF-ADHERED		
PRIMER		
MASTIC / TERMINATION SEALANT		

AIR BARRIER PROTECTION:

The air barrier system shall be protected during construction. Indicate below how the components will be protected (method used), by whom, and when. Delete those that do not apply.

COMPONENT	METHOD USED FOR PROTECTION	SUBCONTRACTOR	WHEN
SPF INSULATION – FIELD OF WALL			
SPF INSULATION (WALL) – VOIDS / CRACKS / SHIMS			
SPF INSULATION – FIELD OF ROOF			
FLUID-APPLIED MEMBRANE – PERMEABLE - WALL			
FLUID-APPLIED MEMBRANE – IMPERMEABLE -WALL			
SELF-ADHERED MEMBRANE – PERMEABLE - WALL			
SELF-ADHERED MEMBRANE – IMPERMEABLE -WALL			
SELF-ADHERED MEMBRANE – PERMEABLE - ROOF			
SELF-ADHERED MEMBRANE – IMPERMEABLE -ROOF			
TRANSITION MEMBRANE – SELF-ADHERED			
PRIMER			
MASTIC / TERMINATION SEALANT			

AIR BARRIER REPAIR:

Discuss how any damage, including but not limited to, accidental holes in the air barrier system, will be repaired – and by whom. Indicate the actual product to be used to perform any repairs in the air barrier components. Delete those that do not apply.

COMPONENT	PRODUCT TO BE USED FOR REPAIR	SUBCONTRACTOR RESPONSIBLE
SPF INSULATION – FIELD OF WALL		
SPF INSULATION (WALL) – VOIDS / CRACKS / SHIMS		
SPF INSULATION – FIELD OF ROOF		
FLUID-APPLIED MEMBRANE – PERMEABLE - WALL		
FLUID-APPLIED MEMBRANE – IMPERMEABLE -WALL		
SELF-ADHERED MEMBRANE – PERMEABLE - WALL		
SELF-ADHERED MEMBRANE – IMPERMEABLE -WALL		
SELF-ADHERED MEMBRANE – PERMEABLE - ROOF		
SELF-ADHERED MEMBRANE – IMPERMEABLE -ROOF		
TRANSITION MEMBRANE – SELF-ADHERED		
PRIMER		
MASTIC / TERMINATION SEALANT		

INSULATION SECURED TO OR OVER AIR BARRIER MATERIAL:

Address any concerns or issues of installing insulation over the air barrier material (foundation, walls, and roof), such as preparation, securing, or fastening methods. Delete those that do not apply.

INSULATION TYPE	METHOD FOR SECUREMENT	CONCERNS (IF ANY)
SPF		
XPS		
POLYISO		
EPS		
EPX		

CFSF-S LOCATIONS: DELETE IF THEY DO NOT APPLY.

Where CFSF-S is a component in the exterior wall assembly, the air barrier installer may need to mark the material itself to indicate where the framing is located. The insulation subcontractor, in turn (when the insulation is not the air barrier), may need to transfer those marks onto the insulation. If any of the above is required, discuss and identify below. Delete those that do not apply.

COMPONENT	SUBCONTRACTOR RESPONSIBLE FOR LOCATION MARKS, IF NECESSARY
SHEATHING	
AIR BARRIER	
INSULATION	

OTHER CONSIDERATIONS OR COMMENTS:

_____

_____

_____

_____

END OF AIR BARRIER SYSTEM PRE-INSTALLATION CONFERENCE GUIDE

END OF SECTION 018317

SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 DEFINITIONS

A. "Remove": Carefully detach or dismantle items from existing construction and properly dispose of or recycle off site, unless items are indicated to be salvaged or reinstalled.

B. "Salvage" or "Remove and Salvage": Carefully detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition. If indicated to be reinstalled, store in a secure area until ready for reinstallation.

C. "Reinstall" or "Remove and Reinstall": Carefully detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

D. "Existing", "Existing to Remain" or "ETR": Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1. Not all existing construction to remain shall be noted with one of these terms on the Drawings; the intent is to assist the Contractor in areas where it may be difficult to determine. Existing construction shall be assumed to remain unless specifically noted to be removed - either when noted with "remove", "salvage", or "reinstall" terminology per above, or when indicated graphically in accordance with the Demolition Legend on the Demolition Drawings.

1.02 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1. Hold the preinstallation meeting at the Project site; perform a walkthrough to review the existing conditions and highlight areas of particular concern.
2. Review structural concerns and deficiencies in the existing building(s).
3. Review demolition schedule, including phasing.
4. Review specific elements indicated to remain or to be salvaged, and review procedures for protection and / or storage of those elements.
5. Review Owner's occupancy and noise requirements.

B. Coordination: Coordinate phasing and staging requirements with Owner's occupancy of the existing building.

1. Coordinate with Division 01 sections for Owner's occupancy, phasing, and noise requirements.
2. Owner's personnel shall remove existing equipment and furnishings from spaces to be demolished prior to the beginning of the Work. Except for any built-in equipment specifically indicated on the Drawings to remain and be protected, the Contractor will not be required to work in furnished areas and will not be responsible for the condition of furniture or equipment left in place.

1.04 SUBMITTALS

A. Photographic Documentation: Submit photographic record of the existing conditions, either as still photographs or as a video-recorded walkthrough. Contractor shall perform walkthrough of existing conditions with Owner's representative prior to site mobilization.
   1. Photographic documentation shall clearly show existing damage and wear on existing surfaces that may be interpreted as being caused by subsequent demolition and construction operations.
   2. For still photographs, submit marked-up plan(s) indicating locations where photographs were taken and direction photograph is facing. Include a written narrative to describe existing damage and other conditions as deemed necessary.
   3. For video recordings, include a spoken narrative to describe locations and existing conditions, or provide a supplementary written narrative.
   4. Submit all photographic documentation as digital photo / video files, and supplementary narratives and plans as PDF files. Submit as part of the initial submittal package required prior to release of the first request for payment.

B. Shop Drawings: Submit demolition plans and survey as required by OSHA and local AHJs.
   1. Engineering Survey: Provide structural survey of existing building(s). Provide additional surveys if unforeseen conditions are revealed during the course of the Work.
   2. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
   3. Indicate elements to be salvaged and elements that are to remain in place and protected.

C. Refrigerant Certification: Provide a written statement, signed by refrigerant recovery technician, certifying that refrigerant materials were recovered in accordance with EPA regulations. Statement shall include certified technician's full name and business name as applicable, address, and date of recovery.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Technicians removing or disposing of any equipment or appliance containing ozone-depleting refrigerants shall be certified in accordance with EPA Section 608 Technician Certification.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Perform an initial walkthrough and visual survey of the existing building(s). Take photographic documentation of the existing conditions per submittal requirements above.

B. Perform structural engineering survey of the existing conditions as required by OSHA and local AHJs.

3.02 PREPARATION

A. Remove and salvage items indicated to be reinstalled or turned over to Owner. Clean items and protect in secure packaging, and store in a secure location on-site.

3.03 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. All demolition work shall be considered unclassified. Barring discovery of hazardous materials or undocumented structural components, where elements are indicated to be demolished, the bid price shall be for complete demolition of the element, regardless of the individual component makeup of that element.

B. Refrigerant Recovery: Certified recovery technician shall remove refrigerant from all applicable equipment and appliances prior to the start of demolition activities.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered during performance of the Work.
   1. If suspected hazardous materials are discovered during demolition operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

D. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Fire Safety: Comply with applicable requirements of the International Fire Code; Chapter 33, and with NFPA 241.
      a. Use of explosives is not permitted.
      b. Hot Work: Remove all combustibles from areas where hot work is required, including use of cutting torches, welding, or heating equipment. Maintain fire watch for entire duration of hot work and for a minimum 30 minutes after completion of hot work.
         1) Keep portable fire extinguishers within 30 feet of locations where hot work is being performed for entire duration.
      c. Maintain egress routes and emergency access routes at all times; do not allow demolished materials to accumulate and block routes.
      d. Remove combustible demolished materials from the building by the end of each work day. Temporarily store combustible materials in noncombustible containers with self-closing lids until they can be removed from the building.
      e. Do not burn demolished material on site.
   3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   6. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   7. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
   8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

E. Do not begin removal until receipt of notification to proceed from Owner.

F. Do not begin removal until built elements to be salvaged, relocated, or reinstalled have been removed.

G. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.

2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

H. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

I. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Comply with requirements of Section 017419 - Construction Waste Management and Disposal.
2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

J. If items of potential historic interest are discovered during the course of the Work, such as cornerstones or plaques, consult with the Owner prior to proceeding. If Owner wishes to preserve these items, carefully remove and salvage, and store in on-site location designated by Owner.

3.04 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.05 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
1. Verify construction and utility arrangements are as indicated.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

D. Protect existing work to remain.
1. Prevent movement of structure. Provide shoring and bracing as required.
2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

4. Patch to match new work.

E. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

F. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Coordinate with Section 011000 - Summary for limitations on outages and required notifications to Owner, as applicable.
   4. Verify that abandoned services serve only abandoned facilities before removal.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

G. Floor Finishes: After removal of existing floor finishes including backings, underlayments, and thick set mortar beds, remove all residual adhesives and glue. Provide grinding, sanding, or shot-blasting of existing concrete floor slab to achieve the proper surface to receive new indicated floor finish. Coordinate slab surface preparations required for each new indicated floor finish with appropriate subcontractor.

H. Carpet: Coordinate with Division 9 carpet manufacturer and Division 1 Construction Waste Management section for recycling of existing sheet or tile carpet. Remove carpet carefully and remove all loose debris and metal (tacks, nails, stretcher strips). Coordinate with Carpet and Rug Institute guidelines for removal and disposal of adhesives. Cut sheet carpeting and carpet padding into four foot sections and tightly roll and wrap. Stack carpet tile on 36 inch or smaller pallets, no higher than 4 feet, and shrink wrap. Store in a protected, dry location in preparation for delivery to reclamation/recycling facility.

I. Acoustical Ceiling Panels: Coordinate with Division 9 acoustical ceiling panel manufacturer and Division 1 Construction Waste Management section. Remove ceiling tiles and stack neatly on pallets; wrap or band pallet loads. Store in a protected, dry location in preparation for delivery to recycling facility.

J. Concrete: Cut neatly in straight lines with power-driven saw with diamond-tooth blade or other type specifically intended for concrete and masonry. Break up and remove carefully, avoiding damage to adjacent flooring that will remain exposed in the finished work.

K. Masonry: Remove masonry in whole units at exposed surfaces, new openings, and unless otherwise indicated, to allow for toothing-in of new masonry.
   1. Solid masonry may be cut with power saw where masonry edges will be concealed by the finished work. Do not cut hollow masonry.

L. Existing Surfaces to Receive Finishes: Remove miscellaneous hangers, exposed nails not serving as fasteners, and similar protrusions; remove adhesive residue and tape; fill anchorage holes; and otherwise patch and restore surface to be a uniform substrate suitable for applied finishes.

3.06 DEBRIS AND WASTE REMOVAL

A. Comply with requirements of 017419 - Construction Waste Management and Disposal.

B. Remove all debris, trash, and other materials not indicated to be salvaged or reinstalled from the site.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024100

SECTION 028000
HAZARDOUS MATERIALS REMEDIATION

PART 1 GENERAL

1.01 GENERAL

A. Provide hazardous material remediation of asbestos-containing materials (ACM) and lead-containing paint in strict accordance with applicable laws, ordinances, criteria, rules, guidelines, and regulations of Federal and state authorities governing asbestos and lead-containing paint abatement, including removing, handling, storing, transporting, and disposing of hazardous waste materials.

B. The ACM and lead-containing paint to be remediated as part of the contract are identified in the following survey report:

1. "Inspection Report" by Ecosystems Environmental Services, Inc (EESIVA), dated October 15, 2026.

1.02 SUBMITTALS

A. Asbestos Hazard Remediation Plan:

1. Develop and submit a detailed, job-specific Asbestos Hazard Remediation Plan prepared by an Asbestos Abatement Project Designer, licensed in the state where the project is located. Detail engineering controls and work procedures, including administrative controls, safety precautions, and removal techniques to be used in the abatement of ACM.
2. Provide a detailed description of the method of containment to ensure that airborne asbestos concentrations as outlined in 29 CFR 1926.1101 are not exceeded in the regulated area.
3. The plan shall include safety precautions such as lockout, tag out, and equipment work procedures to be used in the removal of ACM. Also include fire and medical emergency response plans.
4. The plan shall detail housekeeping and hygiene practices and the specific types of protective clothing, equipment, and respirator to be used.
5. The plan must be approved by Owner prior to starting any remediation work.

B. Lead-Containing Paint Remediation Plan:

1. Develop and submit a detailed, job-specific Lead-Containing Paint Remediation Plan prepared by a Lead-Based Paint Abatement Supervisor or Project Designer certified by the EPA or by the State where the Project is located.
2. Provide a detailed description of work procedures, including occupant protection, housekeeping, cleanup, and hygiene practices, including specific types of protective clothing, equipment, and respirator to be used.
3. Provide a detailed description of the methods of containment to prevent infiltration of lead-containing materials into other areas of the existing facility.
4. The plan must be approved by Owner prior to starting any remediation work.

C. Permits: Submit copies of required permits.

D. Transport/Disposal Documentations: Submit invoice or manifest from a landfill that has a permit to accept hazardous waste materials; include quantity of hazardous waste accepted.

1.03 QUALITY ASSURANCE

A. Licensing and Training: The Hazardous Materials Subcontractor and all personnel involved in performing asbestos and lead-containing paint abatement and disposal operations are required

to be trained and licensed or certified in the state where the project is located prior to the time of the initial job assignment and in accordance with 29 CFR 1926.1101 and EPA regulations.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION AND REMEDIATION

A. The Hazardous Materials Subcontractor shall secure all necessary permits, provide necessary notifications, and pay required fees, in conjunction with hazardous material removal, hauling, and disposal, as required by Federal and state regulations and guidelines. Submit copies of all required permits and hazardous waste manifests to the Owner within 14 days of receipt. Notify the Regional Office of the EPA in accordance with Federal regulation.

B. Conduct remediation in compliance with Federal and state regulations and guidelines.

3.02 FIELD QUALITY CONTROL / AIR MONITORING

A. The Owner will hire a 3rd party testing/monitoring firm to provide visual inspections and air monitoring testing after abatement, and to provide final certificate verifying removal of asbestos is complete.

END OF SECTION 028000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with fly ash or ground granulated blast-furnace slag.

1.3 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Qualification Data: For Installer, manufacturer, testing agency.

C. Welding certificates.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

E. Field quality-control reports.

F. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mix water to be withheld for later addition at Project site.

G. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

H. Construction Joint Layout: Indicate proposed construction joints required to construct the structure. Location of construction joints is subject to approval of the Architect.

I. Control Joint Layout: Indicate proposed locations of slab-on-grade control joints (construction joints and saw-cut contraction joints).

1. Locate construction joints at locations as indicated or, where not indicated, in accordance with ACI.

J. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

K. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.

4. Curing materials.
5. Floor and slab treatments.
6. Bonding agents.
7. Vapor barriers.
8. Joint-filler strips.
9. Repair materials.

L. Samples: For vapor barriers.

1.4 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. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be 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.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Special Inspector.
   c. Ready-mix concrete producer.
   d. Concrete subcontractor.
   e. Special concrete finish subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips,

forms and form removal limitations, vapor-barrier installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

3. Verify that the concrete slab will meet the minimum requirements for each special finish.
4. Confirm that the General Contractor through coordination with other trades will be responsible for the protection of the slab during construction to ensure that no contaminants such as (but not limited to) oil, grease, paint, adhesives, flux, etc. will be present at the time of concrete finishing operations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed (weldable).
C. Plain-Steel Wire: ASTM A 82, as drawn.
D. Plain-Steel Welded Wire Fabric: ASTM A 1064, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I, II, or I/II.
   a. Fly Ash: ASTM C 618, Class F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
   1. Nominal Maximum Aggregate Size: 1 inch
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494, Type A.
   2. Retarding Admixture: ASTM C 494, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.6 VAPOR BARRIERS

A. Vapor Barrier: A 15 mil vapor barrier meeting or exceeding the requirement of ASTM E 1745 Class A; with a water vapor transmission rate (WVTR) of 0.008 grains/h-sq. ft. or lower when tested in accordance with ASTM E96 or ASTM F1249; and wherein the vapor barrier component (plastic) is no less than 15 mils thick in accordance with ACI 302.1 R-96, and consists of multi-layer extruded virgin polyolefin plastic. Ungraded polyethylene sheet is not acceptable. Include companion joint tape, mastic, and accessory materials.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Insulation Solutions, Inc.; Viper VaporCheck II 15-mil.
      b. Poly-America, L.P.; Husky Yellow Guard 15 mil.
      c. Stego Industries, LLC; Stego Wrap 15 mil Class A.
      d. W.R. Meadows, Inc.; Perminator 15 mil.

B. Lap and seal all joints and repair any damage in accordance with manufacturers approved printed instructions.

2.7 BASE COURSE

1. Base Course: Granular, densely-graded "crusher run" material with a balanced fine content, such as VDOT 21A or 21B. The base course shall be compacted and shall be finished to a flat, smooth, low-friction surface.

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Curing and Sealing Compound (designated as "CONC-SLR" on Finish Schedule): ASTM C1315, Type I, Class A; 25% solids. Liquid, membrane-forming, clear, non-yellowing water-based acrylic. Maximum VOC emissions of 100g/L.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Euclid Chemical Company (The); Super Diamond Clear Vox.
   b. SpecChem; Cure & Seal WB 25.
   c. W.R. Meadows, Inc.; VOCOMP-25.

2.9 FLUID APPLIED FLOOR TREATMENT

A. Fluid Applied Floor Treatment (designated as "RES" on Finish Schedule): Refer to Specification 096700 "Fluid-Applied Flooring and Walls".

2.10 RELATED MATERIALS

A. Isolation Joint-Filler Strip: ASTM D 1751, pre-formed asphalt-saturated cellulosic fiber, with scored top strip to facilitate installation of sealant. Thickness shall be ½" unless otherwise indicated.

B. Expansion Joint Filler Strip: Pre-formed closed cell polyethelene foam with pressure sensitive adhesive, and scored top strip to facilitate installation of sealant. Thickness shall be ½-inch unless otherwise indicated.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

2.12 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data basis, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Silica Fume: 10 percent
4. Total Fly Ash and Silica Fume: 35 percent
5. Total Fly Ash, Silica Fume and Ground Granulated Blast-Furnace Slag: 50 percent

D. Footings: Proportion normal-weight concrete mix as follows:

1. Minimum Compressive Strength: As indicated.
2. Maximum Water to Cement Ratio: 0.55.
3. Maximum Slump: 4 inches.
4. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.

E. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
   1. Minimum Compressive Strength: As indicated.
   2. Maximum Water to Cement Ratio: 0.50.
   3. Maximum Slump. 5 inches.

F. Slab-on-Grade (Exterior Pad): Proportion normal-weight concrete mix as follows:
   1. Minimum Compressive Strength: As indicated.
   2. Maximum Water to Cement Ratio: 0.45.
   3. Maximum Slump. 5 inches.

G. Suspended Slabs on Composite Steel Deck: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: As indicated.
   2. Maximum Water to Cement Ratio: 0.50.
   3. Slump Limit: 5 inches, plus or minus 1 inch.

H. Walls and Piers: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: As indicated.
   2. Maximum Water to Cement Ratio: 0.50.
   3. Maximum Slump: 5 inches.
   4. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

I. Retaining Walls: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: As indicated.
   2. Maximum Water to Cement Ratio: 0.50.
   3. Maximum Slump: 5 inches.
   4. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

J. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as indicated.

K. Do not air entrain concrete to trowel-finished interior floors, floors to receive dry shake hardener, slabs scheduled to receive epoxy finish or other floor finishes whose manufacturer recommends limited air content, and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

L. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

M. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) 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 water-cementitious materials ratio below 0.50.

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

F. Chamfer exterior corners and edges of permanently exposed concrete.

G. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

J. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.
2. Install dovetail anchor slots in concrete structures indicated.

3.3 VAPOR BARRIERS

A. Sheet Vapor Barriers: Place, protect, and repair sheet vapor barrier/retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape and mastic.
2. Seal vapor barrier to vertical interruptions/elements, including foundation walls, columns, and utilities.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

1. Notify the Owner's Testing Agent to permit inspection of sub-base a minimum of 24 hours prior to placement of reinforcing steel and concrete. The Owner's Testing Agent shall inspect and approval all foundation subgrades prior to placing concrete.

2. Notify the Owner's Testing Agent to permit inspection of reinforcing steel a minimum of 24 hours prior to placement of concrete. Notify Owner 24 hours in advance of any scheduled concrete pour.

B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of ¼ inch in one direction.

1. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
    b. Specified overall values of flatness, F(F) 30; with minimum local values of flatness, F(F) 24; for unshored slabs on deck.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Screed, tamp, and trowel finish concrete surfaces.

3.10 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1. Method should be coordinated for compatibility with final floor finish by one or a combination of the following:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape. Do not allow tape of any kind to be applied to or come in contact with a floor slab requiring stain, prior to or after stain has been applied.
    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period. Liquid curing materials must not be used on concrete scheduled to be stained.
    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial

application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing and sealing compound without damaging concrete surfaces by method recommended by curing and sealing compound manufacturer unless manufacturer certifies curing and sealing compound will not interfere with bonding of floor covering used on Project.

3.11 FLUID APPLIED FLOOR TREATMENT

A. Fluid Applied Floor Treatment: Prepare concrete surface in accordance with fluid applied floor treatment manufacturer's written instructions. Prepare, apply, and finish fluid applied floor treatment according to manufacturer's written instructions.

B. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs. Curing compounds and sealers are usually considered unacceptable at fluid applied floor treatment locations. If curing compounds and sealers are used, approval from the fluid applied treatment manufacturer shall be obtained for them to remain; or remove the curing compound and sealer after concrete curing to the applied floor treatment manufacturer's satisfaction.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler, where indicated, according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six months. 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 joint clean and dry.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 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 in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. 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 will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match

before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. 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.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement.

B. Concrete Testing: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of five standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days, three at 28 days, and hold one specimen in reserve for test at 56 days.
    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. Strength of each concrete mix 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.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

E. 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.

F. Additional Tests: 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. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

G. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

H. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

3.15 PROTECTION OF FLUID APPLIED FLOOR TREATMENTS

A. Protect fluid applied floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by fluid applied floor treatments installer.

END OF SECTION 033000

SECTION 035400
CAST UNDERLAYMENT

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens).

B. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.

C. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

B. Certificate: Certify that products meet or exceed specified requirements.

C. Manufacturer's Instructions.

1.03 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, with references available on request for jobs of similar size and scope.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.05 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cementitious Underlayment:
   1. ARDEX Engineered Cements; ARDEX K 15 with ARDEX P51 Primer.
   2. Custom Building Products; CL-150 Self-Leveling Underlayment with CP-A Acrylic Primer.
   3. Dayton Superior Corporation; EconoLevel with J42 Primer.
   4. Dependable Chemical Co., Inc; SKIMFLOW ES with PRIMER A.
   5. H.B. Fuller Construction Products, Inc; TEC Level Set 200 Self-Leveling Underlayment with TEC Multipurpose Primer.
   6. Lambert Corporation; Lambco L-16 Self-Level with Primer L16.

7. LATICRETE International, Inc; LATICRETE SUPERCAP SC500 with LATICRETE SUPERCAP Primer Plus.
8. MAPEI Corporation; Ultraplan 1 Plus with Primer T.
9. Maxxon Corporation; Level-One EZ with Multi-Use Acrylic Primer.
10. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Cast Underlayments, General:
   1. Comply with applicable code for combustibility or flame spread requirements.
   2. Provide certificate of compliance from authority having jurisdiction indicating approval of underlayment materials in the required fire rated assembly.

B. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 4000 pounds per square inch after 28 days, tested per ASTM C109/C109M.
   2. Flexural Strength: Minimum 1000 psi after 28 days, tested per ASTM C348.
   3. Density: 125 pounds per cubic foot, nominal.
   4. Final Set Time: 1-1/2 to 2 hours, maximum.
   5. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch.
   6. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch in size and acceptable to underlayment manufacturer.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

E. Primer: Manufacturer's recommended type.

F. Joint and Crack Filler: Latex-based filler, as recommended by manufacturer.

2.03 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.

B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

C. Vacuum clean surfaces.

D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

E. Close floor openings.

3.03 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Pump or pour material onto substrate. Do not retemper or add water.

1. Pump, move, and screed while the material is still highly flowable.
2. Be careful not to create cold joints.
3. Wear spiked shoes while working in the wet material to avoid leaving marks.

C. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

D. For final thickness over 1-1/2 inches, place underlayment in layers. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.

E. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

F. If a fine, feathered edge is required for transition, steel trowel the edge after initial set, but before it is completely hard.

3.04 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.05 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION 035400

SECTION 040100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

B. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.
   2. Review conditions of installation, installation procedures, and coordination with related work.

1.03 SUBMITTALS

A. Product Data: Provide data on cleaning compounds.

B. Samples: Submit full range of pointing mortar samples.

C. Manufacturer's Instructions: For cleaning materials, indicate special procedures and conditions requiring special attention.

1.04 QUALITY ASSURANCE - MASONRY WORK

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

1.05 FIELD CONDITIONS - MASONRY WORK

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

A. Cleaning Agent: Detergent type.
   1. Detergent Solution: Job-mixed solution consisting of 2 cups of tetrasodium pyrophosphate and 1/2 cup of laundry detergent to 5 gallons of water.

2.02 BRICK AND MORTAR MATERIALS

A. Refer to Division 4 Section "Unit Masonry" for brick types and mortar specifications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to be cleaned are ready for work of this section.

3.02 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Cover existing landscaping with tarpaulins or similar covers.

E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

F. Close off adjacent occupied areas with dust proof and weatherproof partitions.

G. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

3.03 REBUILDING

A. Remove existing undamaged brick in whole units using hand tools; salvage and store in a protected location for reuse.

1. Do not cut brick at jambs that will be exposed. Remove whole units for toothing in salvaged brick or for installation of new brick.

B. Support structure as necessary in advance of cutting out units.

C. Mortar Mix: Colored and proportioned to match existing work.

D. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

1. At new openings, tooth in salvaged masonry to match existing pattern, with prefinished masonry faces exposed. Do not expose cut faces in the finished work.

3.04 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.

C. Use hand tools only. Do not use power tools.

D. Do not damage masonry units.

E. When cutting is complete, remove dust and loose material by brushing.

F. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.

G. Moist cure for 72 hours.

3.05 CLEANING EXISTING MASONRY

A. Cleaning Detergent: Brush clean masonry surfaces at all indicated locations with detergent type cleaning agent in accordance with the manufacturer's instructions. Saturate masonry with clean water and flush loose mortar and dirt.

B. Rinse from the bottom up with potable water applied at low pressure (no more than 400 psi).

3.06 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

END OF SECTION 040100

SECTION 042000
UNIT MASONRY

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ACI SP-66 - ACI Detailing Manual.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

E. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

F. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

H. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

I. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

J. ASTM C55 - Standard Specification for Dry-Cast Concrete Building Brick.

K. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).

L. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

M. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units.

N. ASTM C91/C91M - Standard Specification for Masonry Cement.

O. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

P. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

Q. ASTM C151 - Standard Test Method for Autoclave Expansion of Hydraulic Cement.

R. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).

S. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

T. ASTM C331/C331M - Standard Specification for Lightweight Aggregates for Concrete Masonry Units.

U. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

V. ASTM C476 - Standard Specification for Grout for Masonry.

W. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

X. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

Y. ASTM C641 - Standard Test Method for Iron Staining Materials in Lightweight Concrete Aggregates.

Z. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

AA. ASTM C887 - Standard Specification for Packaged, Dry, Combined Materials for Surface Bonding Mortar.

BB. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry.

CC. ASTM D1227/D1227M - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.

DD. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

EE. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.

FF. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls.

GG. BIA Technical Notes No. 20 - Cleaning Brickwork.

HH. BIA Technical Notes No. 28B - Brick Veneer/Cold-Formed Steel Framed Walls.

II. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.

JJ. NCMA TEK 08-04A - Cleaning Concrete Masonry.

KK. NCMA TEK 12-01B - Anchors and Ties for Masonry.

LL. NCMA TEK 12-02B - Joint Reinforcement for Concrete Masonry.

MM. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting at the Project site one week before starting work of this section; require attendance by all relevant installers.

1.03 SUBMITTALS

A. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
   1. Installation Instructions for Cold- and Hot-Weather: Provide a detailed description of the procedures that will be used to comply with TMS 402/602 for cold- and hot-weather, including materials and equipment that will be used.

B. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories, for each type of masonry.
   1. Provide elevations indicating steel reinforcing bar locations; provide details of reinforcing including bends and cross-sections, in accordance with ACI SP-66.
   2. Indicate control and expansion joint locations.
   3. Provide flashing details indicating corners, end dams, and other special conditions.

C. Samples: Face brick and mortar selections will be verified in mock-up panel. Provide samples of exposed accessories and trim requiring color selection.

D. Material Certificates and Test Reports: Provide manufacturer's certificates and test reports for the following:
   1. Masonry Units:
      a. Brick: Size data including fabrication tolerances.
      b. Brick: Efflorescence test, per ASTM C67/C67M.
      c. Masonry Units: Compressive strength test data.
      d. Concrete Masonry: Data indicating aggregates comply with ASTM C33/C33M (normal weight), ASTM C331/C331M (lightweight), and ASTM C618 (fly ash).

2. Mortar and Grout Mixes: Provide description and proportion of materials for each type of mortar and grout.
3. Provide material certificates for each type of metal accessory, including reinforcing bars, joint reinforcement, veneer ties and anchors, and other indicated accessories, indicating compliance with requirements.

E. Cold- and Hot-Weather Procedures: Provide a detailed description of the procedures that will be used to comply with TMS 402/602 for cold- and hot-weather, including materials and equipment that will be used.

F. Installer's Qualification Statement.

1.04 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Fire Rated Assemblies: Provide products that comply with fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent testing thickness, or by means acceptable to authorities having jurisdiction.

C. Source Limitations for Masonry: Provide each type of masonry unit from a single manufacturer's plant, sourced through a single supplier. Each type of masonry unit shall maintain consistency of color and texture for all product required on the entire project. The approved mockup/sample panel shall be used to determine acceptable color and texture range.

D. Source Limitations for Mortar: Provide each mortar mix from a single manufacturer, sourced through a single supplier. Each required mortar mix shall maintain consistency of each component, including cementitious materials and aggregate, to provide consistent color and texture for all product required on the entire project. The approved mockup/sample panel shall be used to determine acceptable color and texture range.

E. Aggregate for Concrete Masonry Units: If bottom ash is used as aggregate in the CMU, the Source for the bottom ash shall be a power station that has a minimum of ten (10) years continuous experience as a supplier of quality material as verified by independent certified laboratory testing and no defects in the marketplace.

F. Pre-Construction Testing: Owner shall engage an independent testing agency to perform field quality control tests, in accordance with Section 014000 - Quality Requirements.
1. Clay Masonry Unit Tests: Testing agency shall test each variety of clay masonry in accordance with ASTM C67/C67M compressive strength requirements.
2. Concrete Masonry Unit Tests: Testing agency shall test each variety of concrete unit masonry in accordance with ASTM C140/C140M compressive strength requirements.

1.05 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Sample Panel: Build a sample panel approximately 48 inches long by 32 inches high. Include each type of masonry veneer and mortar. Include a sealant filled control joint. Construct sample panel next to existing wall to verify masonry veneer and mortar provide an acceptable match to existing.

1.06 FIELD CONDITIONS

A. Wall Cavity Protection: Provide temporary waterproof sheet coverings over masonry walls at top of walls, sills, parapets, and other horizontal projections. Install coverings at end of each workday, when rain or precipitation is expected, and after masonry work is completed.

1. Extend coverings down vertically at least 24 inches on each side of masonry wall. At multi-wythe walls where one wythe is more than 24 inches taller than other wythe(s), extend covering as required to fully cover all wythes and cavities.
    a. At roof parapets, extend covering on rear side of parapet full height down to roof deck/membrane, until vertical protection/roof membrane is installed.
2. Secure all coverings in place with tape or adhesive that does not leave residue, or other securement method that does not penetrate or damage permanent construction.
3. Provide protective coverings at sills and horizontal projections that can also serve as protection from mortar droppings.
4. Provide protective coverings over tops of foundation walls containing insulation to protect from exposure to sun and from construction traffic damage.
5. Do not remove or allow removal of temporary covers until permanent top of wall protection elements (coping, sill, roof surface, waterproof membrane, etc) are underway.

B. Cold- and Hot-Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
2. Special Shapes: Provide nonstandard blocks configured for corners, lintels, headers, other detailed conditions, and as indicated below.
    a. Provide bullnose units for outside corners.
    b. Provide solid block with bullnosed top edges at free-standing CMU walls and where top of block is exposed at window sills and similar applications.
3. Concrete Masonry Units: ASTM C90, lightweight.
    a. Exposed Faces: Manufacturer's standard color and texture.
    b. Aggregates:
        1) Lightweight Aggregates: Lightweight aggregate shall strictly comply with ASTM C331/C331M, ASTM C151, and ASTM C641. Drying shrinkage of aggregate shall not exceed 0.10% at 100 days.
        2) Waste concrete, scoria, and aglite shall not be permitted.

B. Concrete Brick:
1. Actual Size: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
2. Concrete Building Brick: ASTM C55; lightweight, solid, for interior or concealed use.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS or FBX, Grade SW.
1. Color and Texture Basis-of-Design Products:
    a. Brick Type 1: Glen-Gery Brick; Color "Midlothian."
    b. Brick Type 2: Belden Brick; Color "Dutch Gray Velour."
2. Actual Size: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long (modular).

3. Special Shapes: Molded units (plant-fabricated) as required by conditions indicated, unless standard units can be sawn to produce equivalent effect. Cut or sawn edges shall not be exposed in the finished work.
4. Efflorescence: Provide brick that has been tested per ASTM C67/C67M and received a rating of "not effloresced."

B. Building (Common) Brick: ASTM C62, Grade SW, except MW may be used in locations indicated acceptable in reference standard; solid units.
1. Actual size: Match face brick.
2. Locations: May be used in concealed locations in lieu of face brick.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M.
1. Colored Mortar: Premixed cement as required to match Architect's color sample.
2. Available Products:
a. Argos USA; Magnolia Masonry Cement.
b. Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
c. Lehigh Hanson; flamingo Colored Cement.
d. Roanoke Cement; a division of Titan America; Colored Masonry Cement.
e. York Building Products, a Stewart Company; Workrite Colored Masonry Cement.
f. Substitutions: See Section 016000 - Product Requirements.

B. Surface Bonding Mortar (Parge Coat): ASTM C887.

C. Mortar Aggregate: ASTM C144.

D. Grout Aggregate: ASTM C404.

E. Water: Clean and potable.

F. Accelerating Admixture: ASTM C494/C494M, Type C; nonchloride, noncorrosive type for use in cold weather; approved by manufacturer for use in masonry mortar.

2.04 DAMPPROOFING

A. General: Dampproofing may be provided as a Contractor option to parge coat, applied to exterior face of below grade CMU back up wall (prior to insulation or grouting).

B. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
1. Emulsified Asphalt Coating (Brush or Spray Applied): ASTM D1227/D1227M, Type II, Class 1 - Mineral colloid emulsifying agents with non-asbestos fibers or Type III, Class 1 - Mineral colloid emulsifying agents without fibrous reinforcement.
2. Accessory Materials: Provide asphaltic primer, glass fiber reinforcement, and compatible patching compounds as required and as recommended by manufacturer.
3. Manufacturers:
a. Henry Company.
b. Karnak Corporation.
c. Mar-Flex Systems, Inc.
d. W. R. Meadows, Inc.
e. Substitutions: See Section 016000 - Product Requirements.

2.05 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; uncoated.

B. Joint Reinforcement, Anchorage, and Ties, General: Comply with NCMA TEK 12-02B, NCMA TEK 12-01B, and requirements below.
   1. Use ladder type joint reinforcement, unless otherwise indicated. Truss type reinforcement may be used only when approved by Architect, at walls indicated not to have vertical reinforcing steel and not to be grouted.
   2. Provide prefabricated wire mesh joint reinforcement sections for corners and for T-intersections.
   3. Provide joint reinforcement in minimum 10 foot lengths.
   4. At multi-wythe/cavity wall applications, size all anchors, ties, and reinforcement for depths of cavities indicated, including indicated insulation thickness as applicable. Ties shall maintain full adjustability at veneer wythe without affecting insulation.
   5. At cavities with space between wythes wider than 4-1/2 inches (air space + insulation depth), provide high strength ties engineered for cavity depths indicated.

C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Material: Mill-galvanized steel for interior walls, hot-dip galvanized steel for exterior walls.
   2. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

D. Multiple Wythe Joint Reinforcement: ASTM A951/A951M. Provide at composite walls and subgrade walls where all wythes are of the same material.
   1. Material: Mill-galvanized steel for interior walls, hot-dip galvanized steel for exterior walls.
   2. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
      a. Provide two side rods for each wythe that is nominal 6-inch depth or greater, and one side rod for each wythe that is nominal 4-inch depth.

E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M. Provide at cavity walls/masonry veneer walls.
   1. Type: Ladder, with adjustable ties or tabs spaced at 16 in on center.
   2. Material: Hot-dip galvanized steel.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to extend at least halfway through veneer wythe, but provide not less than 5/8 inch of mortar coverage from each masonry face.
   4. Vertical adjustment: Not more than 1 1/4 inches.

F. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.

G. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
   1. For Anchorage to Structural Steel Framing: Crimped wire anchors for welding to frame, 0.25 inch thick, with triangular/trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

H. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B. Provide at masonry veneer walls with metal framing backup. At cavity walls with CMU backup and

masonry veneer, masonry veneer anchors may be used in conjunction with standard horizontal joint reinforcing, at Contractor's option, in lieu of adjustable multiple wythe joint reinforcement.

1. Anchor Plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners.
2. Wire Ties: Manufacturer's standard shape, 0.1875 inch thick.
    a. Size wire ties to extend at least halfway through veneer wythe, but provide not less than 5/8 inch of mortar coverage from masonry face.
3. Vertical Adjustment: Not less than 3-1/2 inches.
4. Products:
    a. Construction Tie Products; CTP-16.
    b. Heckmann Building Products; 213 + 263.
    c. Hohmann & Barnard; HB-213-2x.
    d. Wire Bond; RJ-711.
    e. 3GEN Masonry Products; H-13-H or H-13-V.

I. Metal-to-Metal Fasteners (for Steel Studs): Self-drilling, self-tapping #10 hex screws; fabricated of either 304 stainless steel or of steel with corrosion resistant polymer coating tested to ASTM B117. Fasteners shall include integral neoprene or EPDM washer.
    1. Products:
        a. ELCO Construction Products; Dril-Flex with Stalgard Finish.
        b. Heckmann Building Products; #668 TEK Self-Drilling Steel Stud Screw.
        c. ITW Commercial Construction North America; Teks Maxiseal with Climaseal Finish, or Scots Long Life Teks (stainless steel).

2.06 FLASHINGS

A. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
    1. Stainless Steel Flashing - Self-Adhering: ASTM A240/A240M; minimum 2 mil type 304 stainless steel sheet with minimum 8 mil of butyl adhesive and a removable release liner.
        a. Manufacturers:
            1) 3GEN Masonry Products; Genflash SS SA.
            2) STS Coatings, Inc; Wall Guardian Self Adhering Stainless Steel Flashing.
            3) WIRE-BOND; Bond-N-Flash SA.
            4) York Flashings; York 304 SA.
    2. Stainless Steel/Polymer Fabric Flashing: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on one side to one sheet of polymer fabric.
        a. Manufacturers:
            1) Hohmann & Barnard, Inc; Mighty-Flash Stainless Flashing.
            2) Prosoco; R-Guard SS ThruWall.
            3) STS Coatings; Wall Guardian Stainless Steel TWF.
            4) York Flashings; Multi-Flash SS.

B. Factory-Fabricated Flashing Corners and End Dams: Provide manufacturer's factory-fabricated inside corners, outside corners, and end dams, of material matching primary flashing metal.

C. Termination Bars: One-inch wide, fabricated of 0.090-inch extruded aluminum or 0.075-inch stainless steel; compatible with membrane and adhesives.

D. Drip Plate/Drip Edge: Stainless steel; 45-degree angled drip with hemmed edge; compatible with membrane and adhesives. Provide factory-fabricated outside and inside corner accessories.

E. Flashing Sealant/Adhesive/Liquid Seam Tape: Polyether-based, 100% solids, moisture-curing elastomeric products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates; and that are compatible with asphalt-free flashing materials and air barrier materials. Traditional mastic is not acceptable.
   1. Available Products:
      a. Master Builders Solutions; MasterSeal NP150.
      b. STS Coatings; GreatSeal LT-100 Liquid Tape.
      c. York Flashings; UniverSeal US-100 Liquid Tape.

2.07 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Provide nominal 2.5-inch "standard" and "tee" configurations to suit application unless indicated otherwise.

B. Joint Filler: Closed cell polypropylene or non-chlorinated polyethylene foam; oversized 50 percent to joint width; self expanding; in maximum lengths available.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations. Provide in depth matching cavity depth without gap at front or back of mesh. Fabricate approximately 10 inches high with minimum 6 inch high dovetail shape projections.
      a. Available Products:
         1) Advanced Building Products, Inc; Mortar Break DT.
         2) Heckmann Building Products; WallDefender.
         3) Hohmann & Barnard, Inc.; Mortar Trap.
         4) Mortar Net Solutions; MortarNet.
         5) Wire-Bond; Cavity Net DT (3611D).
      b. At cavities with air space greater than 2 inches, provide companion drainage product by one of the manufacturers above; nominal 1/2-inch thickness by 20 inches wide, to be field inserted into cavity in a "U" configuration. Basis-of-Design is "Mortar Catch 352" by Advanced Building Products, Inc.

D. Bond Break: ASTM D226/D226M, Type I ("No.15") asphalt felt or polyethylene tape.

E. Weeps/Cavity Vents:
   1. Cellular Type: Extruded propylene with honeycomb design.
      a. Color(s): To be selected by Architect from manufacturer's full range.
      b. Available Products:
         1) Advanced Building Products, Inc.; Mortar Break weep mesh.
         2) Blok-Lok Limited; Cell-Vent.
         3) CavClear/Archovations, Inc.; CavClear Weep Vent.
         4) Heckmann Building Products Inc.; No. 85 Cell Vent.
         5) Hohmann & Barnard, Inc.; Quadro-Vent.
         6) Mortar Net Solutions; WeepVent.
         7) Wire-Bond; Cell Vent.
   2. Bed Joint Weep System: Corrugated plastic drainage system incorporating continuous drainage strip within cavity portion of wall with integral weephole extensions at 9-1/2

inches on center located above flashing in the bed joint of the veneer masonry. Provide at masonry units over 32 inches long, and as indicated.

a. Available Products:
   1) Heckmann Building Products; Core/Cavity Vent Weep System #367.
   2) Masonry Technology Incorporated (MTI); Cavity Weep CV 5010.

F. Reinforcing Positioners: Provide wire positioners in bed joints to keep steel reinforcing bars centered in cells, fabricated of 0.1483-inch hot-dip galvanized steel wire.
   1. Available Products:
      a. Heckmann Building Products, Inc.; No. 376 Rebar Positioner.
      b. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
      c. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.08 LINTELS

A. Masonry Lintels: Fabricated of bond beam CMUs, with texture matching adjacent standard CMU. Provide reinforcing bars and grout in accordance with structural requirements. Provide temporary supports until cured.

B. Precast Concrete Lintels: Comply with structural requirements for concrete strength and reinforcing. Precast U-lintels fabricated in accordance with performance standards of PCI MNL-116 with 3500 psi concrete for standard lintels and 6000 psi concrete for prestressed lintels as manufactured by Cast-Crete are acceptable in lieu of rectangular section lintels.

C. Steel Lintels: Refer to Section 055000 - Metal Fabrications.

2.09 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Reinforced masonry: Type S.
   3. Mortar parge coats: Type S.
   4. Exterior, loadbearing and non-loadbearing, and interior, loadbearing and non-loadbearing: Type N, except as indicated above.
      a. Interior, non-loadbearing masonry may use Type O at Contractor's option.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
   1. Use colored mortar for all veneer masonry. Separate colors shall be required for each type and color of veneer.

C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

E. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. For installation in cold or hot weather, comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

1. CMU Coursing: One unit and one mortar joint equal 8 inches.
2. Brick Coursing: Either two or three units with accompanying mortar joints shall equal 8 inches, based on basis-of-design brick size(s) indicated above.

C. Provide running bond for all masonry units unless otherwise indicated.

D. Tool all mortar joints slightly concave where they will be exposed, unless otherwise indicated.

1. Provide flush joints where they will be concealed by surface-applied treatments or finishes other than paint; including but not limited to tile, wall coverings, fluid-applied or SPF air barriers, or membranes.

3.05 PLACING AND BONDING

A. Remove broken, cracked, chipped, or otherwise damaged masonry units from pallets and set aside. Do not use unless they may be field cut to remove damaged section, for installation where special shape is required to fit construction.

B. Create a consistent blend for each type of veneer masonry by mixing units from a minimum of three pallets.

C. Provide asphalt felt or polyethylene tape bond-breaker between clay masonry and concrete or other masonry types. Rake back joints for sealant.

D. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Lay hollow masonry units with face shell bedding on head and bed joints.

F. Remove excess mortar and mortar smears as work progresses.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

1. Do not cut masonry unless it is required for certain shapes, such as rowlock sills, or unless it is unavoidable due to fitting around other construction, such as wall penetrations.
2. Cut masonry edges shall not be visible in the final work. Where special shapes are required that would expose cut edges, they shall be plant-fabricated.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. At parapets and below-grade/foundations, provide joint reinforcement at 8 inches o.c. vertically.

E. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

F. Lap joint reinforcement ends minimum 6 inches.

G. Do not extend reinforcement across control, expansion, and other building movement joints.

H. Reinforce corners and intersections with prefabricated T- or L-shaped reinforcing.

I. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

J. Embed ties and anchors in mortar joint and extend at least halfway through masonry veneer unit; with at least 5/8 inch mortar cover to the outside face of the anchor.

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry and/or Metal Framing Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.10 REINFORCEMENT AND ANCHORAGES - COMPOSITE UNIT MASONRY

A. Install continuous horizontal joint reinforcement at 16 inches o.c. vertically, except at below grade foundation walls install at 8 inches o.c. vertically.

B. Where concrete foundations are indicated, tie below-grade masonry to concrete with rigid anchors spaced at maximum 8 inches o.c. vertically.

C. Coordinate with parging/dampproofing and with installation of insulation, where indicated.

3.11 MASONRY FLASHINGS

A. General: Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Remove or cover protrusions or sharp edges that could puncture flashings.

2. Verify that air barrier transition membrane is in place on substrate wall and installed to a height that will be above the top of flashing. Coordinate with Division 7 air barrier installer.

B. Install flashings and accessory products in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

C. Drip Edge/Drip Plate: Lay in accordance with manufacturer's instructions, in a minimum of two continuous ribbons of sealant.
   1. Overlap drip edges a minimum of 2 inches. At laps, trim the hemmed edge of the top piece so the hemmed edges do not overlap.
   2. At all locations below 6'-0" above grade; ensure that all exterior corners of drip edges are slightly eased or rounded to eliminate sharp, exposed cut metal edges. At overlaps, verify that joints where hemmed edges meet are flush and there are no protruding ends.

D. Terminate flashing up 16 inches minimum on vertical surface of backing:
   1. Anchor vertical leg of flashing into backing with a termination bar and sealant.

E. Extend metal flashings to within 1/2 inch of exterior face of masonry and adhere to top of drip plate/drip edge.

F. Support flexible flashings across gaps and openings.

G. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

H. Seal all lapped ends and penetrations of flashing before covering with mortar.

3.12 LINTELS

A. Comply with requirements on Structural Drawings for type of lintel at each opening, additional lintel sizing, reinforcement, and installation requirements.

B. Install loose steel or precast lintels over openings, where indicated.

C. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
   1. Allow masonry lintels to attain specified strength before removing temporary supports.

D. Maintain minimum 8 inch bearing on each side of opening, unless otherwise indicated.

3.13 GROUTED COMPONENTS

A. Comply with requirements on Structural Drawings for locations of structural grouted components and accessories, including but not limited to, grouted bond beams, reinforced unit masonry walls, (including locations and sizing of vertical steel bar reinforcing), grouted solid CMU, and composite wall collar joints.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

3.14 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Provide control and expansion joints at locations indicated on Drawings, and as follows:
   1. At changes in wall height.

2. At changes in wall thickness
3. At change in support (eg: transition from foundation support to floor slab support).
4. Adjacent to corners of walls within a distance equal to no more than half the maximum control joint spacing.
5. Wall intersections.
6. Do not place control joints closer than 16 inches to edge of wall openings (doors, windows, louvers, ducts).
7. Distance between joints shall not exceed a length to height ratio of 1.5:1.
8. Distance between joints shall not exceed 25 feet where no openings occur between joints.
9. Distance between joints shall not exceed 20 feet where openings occur between joints.

3.15 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Mix mortar (or grout) to a 4-inch maximum slump consistency and hand trowel into place in accordance with Steel Door Institute (SDI-100).
   2. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.16 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.17 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, and other penetrations. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.18 PARGING

A. Dampen masonry walls prior to parging.

B. Parge cavity side of CMU below grade back-up wythe with a single coat of surface-bonding mortar to a total thickness of 1/4 inch.
   1. In lieu of parging, Contractor may at its option apply bituminous dampproofing, at a minimum rate of 1.25 gal per 100 sq. ft. Apply primer if required by manufacturer and comply with manufacturer's installation requirements.

C. Steel trowel surface smooth and flat with a maximum surface variation of 1/8 inch per foot.

D. Strike top edge of parging at 45 degrees.

3.19 FIELD QUALITY CONTROL

A. Field Inspection: The Owner shall engage an independent inspection agency to perform field quality control inspections and prepare field reports.
   1. The Contractor shall permit full access to inspectors in order to perform inspections, including use of temporary facilities and equipment such as scaffolding or lifts.
   2. Do not enclose cavities or spaces to be grouted solid until inspections have approved grout and reinforcement for material properties, size, and installation locations.

B. Field Testing: The Owner shall engage an independent testing agency to perform field quality control tests, as specified in Section 014000 - Quality Requirements. For each type of masonry unit, 5 randomly chosen units shall be sampled for each 5,000 square feet of wall.
   1. Clay Masonry Unit Tests: Testing agency shall test each variety of clay masonry in accordance with ASTM C67/C67M requirements.
   2. Concrete Masonry Unit Tests: Testing agency shall test each variety of concrete unit masonry, of each load-bearing size indicated, in accordance with ASTM C140/C140M requirements.
   3. Mortar Tests: Testing agency shall test each type of mortar in accordance with ASTM C780. Mortar shall be tested on each of the first 3 days. Alert testing agency if mortar mix is altered during construction to allow for retesting.
   4. Grout Test: Testing agency shall test each type of grout in accordance with ASTM C1019. Grout shall be tested on each of the first 3 days. Alert testing agency if grout mix is altered during construction to allow for retesting.

3.20 REPAIR AND CLEANING

A. Remove masonry units that have become damaged or stained, or that do not display acceptable blend of color and texture matching mockup/sample panel. Remove as whole units, do not cut. Replace with new units with fresh mortar joints.

B. Remove excess mortar and mortar droppings.

C. Replace defective mortar and repoint. Enlarge holes or voids at defective mortar, and remove enough adjacent mortar to allow for repointing. Install fresh mortar joint and match to adjacent work.

D. Where expansion/control joints and sealant joints are indicated, clean joints and leave them clear and ready for installation of joint or sealant materials.

E. Clean concrete masonry in accordance with NCMA TEK 08-04A and clean clay masonry in accordance with BIA Technical Notes No. 20. Use hand cleaning/bucket-and-brush methods.

F. To prevent freezing of cleaners and rinse water, do not clean when masonry surface temperature will drop below 40 degrees F.

G. Test cleaning methods and materials on one half of mockup/sample panel; leave the other half uncleaned. Obtain approval of Architect before cleaning the finished work.

H. Protect adjacent non-masonry surfaces from cleaning materials and processes with temporary sheeting or masking.

I. Provide "in-progress" cleaning; clean masonry in each area as soon as possible after mortar has fully cured (approximately 7 to 28 days; coordinate with manufacturer's recommendations for each mortar type specified). Field test a small area to ensure mortar curing is complete prior to large-scale cleaning.

J. Pre-wet masonry surfaces and clean with specified cleaning solution. Rinse surfaces immediately after cleaning; do not allow cleaning solution to dry or set into the masonry.

K. Use non-metallic tools in cleaning operations.

L. Final Cleaning: As part of Project Closeout (prior to Substantial Completion), provide Final Cleaning of masonry veneer. Remove construction dust with a very low pressure rinse. Perform a visual inspection and spot clean to remove efflorescence, staining, or organic growth, in accordance with recommendations of BIA and NCMA technical notes.

3.21 PROTECTION

A. Provide temporary protective waterproof sheet coverings over tops of walls, parapets, sills, and other horizontal projections as the work progresses, in accordance with FIELD CONDITIONS article in Part 1 above.

B. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

C. Provide protective vertical boards and horizontal sheeting at grade level base of walls to prevent staining or splashing from rain, mud, or mortar droppings.

3.22 MASONRY WASTE

A. Fill Material: Clean masonry waste may be used as fill material. Break up masonry waste into small pieces no greater than 4 inches any direction. Mix with Division 31 engineered fill material so that masonry waste is no more than 33% of the fill (1 part masonry waste, 2 parts engineered fill). Fill containing masonry waste shall be at least 18 inches below grade level.

1. Excess waste shall be removed and disposed of or recycled in accordance with Division 1 waste disposal requirements.

END OF SECTION 042000

SECTION 047200
CAST STONE MASONRY

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

G. ASTM C150/C150M - Standard Specification for Portland Cement.

H. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

I. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete.

J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

K. ASTM C1364 - Standard Specification for Architectural Cast Stone.

1.02 SUBMITTALS

A. Product Data: Test results of cast stone components made previously by the manufacturer.

B. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

C. Selection Samples: In the form of manufacturer's color charts, indicating full range of cast stone colors and textures, and mortar colors.

D. Verification Samples: Cast stone units and mortar will be verified in mock-up panel.

E. Source Quality Control Test Reports.

F. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
2. Manufacturer's production facility currently holds a Plant Certification from the Cast Stone Institute or the Architectural Precast Association.
3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.04 MOCK-UP

A. See Section 014000 - Quality Requirements for additional requirements.

B. Integrated Exterior Mockups: Attend preinstallation conference and provide cast stone masonry work for integrated exterior mockup as indicated on Drawings and as specified in Division 1 Section "Quality Requirements."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
1. Arban Precast, Ltd.
2. Arriscraft; division of General Shale.
3. Cast Stone Systems, Inc.
4. Continental Cast Stone.
5. Premier Stoneworks, LLC.
6. Reading Rock, Inc.; RockCast.
7. Southern Castings, Inc.
8. Stafford Stone Works.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
4. Color: To be selected by Architect from manufacturer's full range.
5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
2. Unless otherwise indicated on drawings, provide:

a. Wash or slope of 1:12 on exterior horizontal surfaces.
b. Drips on projecting components, wherever possible.
c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.
1. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C494/C494M.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
1. Galvanized in accordance with ASTM A767/A767M, Class I.

H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.04 SOURCE QUALITY CONTROL

A. Test compressive strength and absorption of specimens selected at random from plant production.
1. Test in accordance with ASTM C642.
2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 042000.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
1. Drench cast stone components with clear, running water immediately before installation.

2. Set units in a full bed of mortar unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
   1. Rake mortar joints 3/4 inch for pointing.
   2. Remove excess mortar from face of stone before pointing joints.
   3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
   4. Leave the following joints open for sealant:
      a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
      b. Joints in projecting units.
      c. Joints between rigidly anchored units, including soffits, panels, and column covers.
      d. Joints below lugged sills and stair treads.
      e. Joints below ledge and relieving angles.
      f. Joints labeled "expansion joint".

B. Installation Tolerances:
   1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
   2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
   3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
   4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.

B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.

C. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

3.06 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION 047200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract and of the Contract documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer structural steel connections, required by the Contract Documents to be selected or completed by the fabricator, to withstand design loadings indicated.

B. Recycled Content: Provide products with a minimum post-consumer recycled content of 75%.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, fabricator, professional engineer, and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Tension-control, high-strength bolt-nut-washer assemblies.
3. Shear stud connectors
4. Shop primers.
5. Nonshrink grout.

F. Source quality-control reports.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabricator shall participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant, Category STD, or shall employ an approved independent inspection or quality control agency to conduct periodic, in plant inspections at the fabricator's plant at a frequency that will assure the fabricator's conformance to the requirements of the inspection agency's approved quality control program.

B. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992, Grade 50

B. Channels, Angles, M -Shapes: ASTM A 572, Grade 50

C. Plate and Bar: ASTM A 36

D. Cold-Formed Hollow Structural Sections (HSS): ASTM A 500, Grade C.

E. Steel Pipe: ASTM A 53, Grade C.

1. Weight Class: Standard
2. Finish: Black except where indicated to be galvanized

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM F 1325 Grade A325 or A490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 3125 Grade F1852 or F2280, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

D. Unheaded Anchor Rods: ASTM F 1554, Grade 55

1. Configuration: Straight.
2. Nuts: ASTM A 563 heavy-hex carbon steel.
3. Plate Washers: ASTM A 36 carbon steel.
4. Washers: ASTM F 436, Type 1, hardened carbon steel.
5. Finish: Plain.

E. Headed Anchor Rods: ASTM F 1554, Grade 55, straight.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36 carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Plain.

F. Threaded Rods: ASTM A 36.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM A 36 carbon steel.
3. Finish: Plain.

2.3 PRIMER

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

C. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning ."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surface of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning" or SP 3, "Power Tool Cleaning" (Concealed Steel)
2. SSPC-SP 6, "Commercial Blast Cleaning" (Exposed Steel – Exterior and Interior)

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels in exterior walls and all exterior structural steel not scheduled to receive finish paint.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner's independent testing and inspecting agency may perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using High-Strength Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections may be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base, Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M [and AWS D1.8/D1.8M] for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs at exposed steel, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

1. The independent testing and inspecting agency will provide a certified welding inspector (CWI) to perform field inspections and tests, and to report whether tested Work complies with or deviates from requirements.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. KCS-type K-series steel joists
3. Joist accessories.

1.3 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders", Code of Standard Practice."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings: Show layout, designation, number, type, location, and spacing of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.

1. Indicate locations and details of bearing plates to be embedded in other construction.

C. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Welding certificates.

C. Manufacturer certificates.

D. Mill Certificates: For each type of bolt.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

3. Professional Engineer Qualifications: A professional engineer who is legally authorized 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 joists that are similar to those indicated for this Project in material, design, and extent.

B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

1. Welders shall be AWS certified and shall be qualified for welding processes involved and, if pertinent, have undergone recertification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications".

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

1. Use ASD. Data is given at service-load level.

2. Recycled Content: Provide products with a minimum post-consumer recycled content of 60%.

2.2 PRIMERS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord (unless noted otherwise), of joist type indicated.

1. Joist Type: K-series steel joists and KCS-type K-series steel joists.

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Do not camber steel roof joists.

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal and diagonal bridging of material, size, and type required by SJI's "Specifications for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Steel bearing plates with integral anchorages are specified in Division 5.

C. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface unless otherwise indicated.

D. Welding Electrodes: Comply with AWS standards.

E. Galvanizing Repair Paint: ASTM A 780.

F. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field connect joists to supporting structure as indicated. Where welding is indicated, coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and to perform field tests and inspections and prepare test and inspection reports.

B. Visually inspect field welds according to AWS D1.1.

1. In addition to visual inspection, test field welds according to AWS D1.1 and the following procedures, as applicable:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709.
c. Ultrasonic Testing: ASTM E 164.
d. Radiographic Testing: ASTM E 94.

C. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

D. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
2. Apply a compatible primer of same type as primer used on adjacent surfaces.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the Contract Documents apply to the work of this section.

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.
2. Composite floor deck.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding Certificates: Copies of certificates for welding procedures and personnel.

B. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.

C. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck 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. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G60 zinc coating, as indicated.
2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33 G60 zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard baked-on, rust-inhibitive primer, as indicated.
3. Deck Profile: Type WR (wide rib), as indicated.
4. Profile Depth: As indicated.
5. Design Uncoated-Steel Thickness: As indicated.
6. Span Condition: Triple span or more.
7. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 40, G60 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Triple span or more.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Galvanizing Repair Paint: ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate decking bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter and spacing indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated.

1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints lapped 2 inches minimum.

D. Miscellaneous Roof Deck Accessories: Install finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: As indicated.
2. Weld Spacing: Space and locate welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Butted.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a certified welding inspector (CWI) to perform field quality control testing.

B. Field welds will be subject to inspection.

C. CWI will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

C. Repair Painting: Wire brush and clean rust spots, weld, and abraded areas on underside of prime paint deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED STEEL FRAMING – STRUCTURAL (CFSF-S)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. This Section includes the following structural cold-formed steel framing, noted as "CFSF-S."
   1. Interior non-load-bearing wall framing indicated as "CFSF-S."
   2. Exterior non-load bearing wall framing.
   3. Roof rafter framing.
   4. Soffit, Bulkhead, Cornice and Ceiling support/joist framing.

B. Related Sections include the following:
   1. Division 09 Section "Cold-Formed Steel Framing – Non-Structural (CFSF-NS)" for interior non-load-bearing, steel-stud framing and ceiling-suspension assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Interior Non-Load-Bearing Wall Framing designated as "CFSF-S:" Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.
      b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
      c. Roof Rafter Framing: Vertical deflection of 1/240 of the horizontally projected span for total load.
      d. Ceiling Support/Joist, Soffit, Bulkhead and Cornice Framing: Vertical deflection of 1/360 of the span for total load.
   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of 1/2 inch.

C. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory indicated.

B. Shop Drawings: Submit shop drawings for framing designated as CFSF-S. Show layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed steel framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer and testing agency.

E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Power-actuated anchors.
3. Mechanical fasteners.
4. Vertical deflection clips.
5. Horizontal drift deflection clips
6. Miscellaneous structural clips and accessories.

F. Research/Evaluation Reports: For cold-formed steel framing, evidence of cold-formed steel framing's compliance with building code in effect for Project, from a model code organization (IBC) acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the Commonwealth of Virginia and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed steel framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency**,** or in-house testing with calibrated test equipment indicating steel sheet complies with requirements,

including base-steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed steel framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

H. Mockup: Provide and install CFSF-S to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed steel framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G90 (Z275).

C. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90 (Z275).

2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Steel Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1-5/8 inches (41 mm), minimum.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Steel Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches (32 mm).

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. ClarkDietrich Building Systems.
   b. Marino\Ware Industries.
   c. SCAFCO Corporation
   d. The Steel Network, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Steel Thickness: Matching steel studs.
2. Flange Width: 2 inches, minimum.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.3 ROOF-RAFTER FRAMING

A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1-5/8 inches (41 mm), minimum.

2.4 SOFFIT, BULKHEAD, CORNICE AND CEILING SUPPORT/JOIST FRAMING

A. Steel Ceiling Supports/Joists, Bulkhead, Cornice and soffit framing: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Steel Thickness: 0.0428 inch (1.09 mm).
2. Flange Width: 1-5/8 inches (41 mm), minimum.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.

6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Nonmetallic, Non-shrink Grout: Premixed, non-metallic, non-corrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.

D. Sill-Sealer Gaskets: Closed-cell neoprene foam or closed-cell non-crosslinked polyethylene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. "Sill Seal" by Sandell division Hohmann & Barnard, Inc.
b. "Cello Seal" by Cellfoam
c. GreenGuard "Sill Sealer" by Pactive Corporation

2.8 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.

2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appear-ance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed steel framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

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.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 7 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Connect vertical deflection clips to infill studs and anchor to building structure.
   3. Connect drift clips to cold formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
   1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
   2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches (51 mm) from abutting walls, and with spacing as indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
   1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 054003.13
CONTINUOUS INSULATION (CI) FRAMING SYSTEM - BRACKET

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

F. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members.

G. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

H. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

I. ASTM F594 - Standard Specification for Stainless Steel Nuts.

J. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric.

K. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.02 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Conduct pre-installation meeting at Project site before starting work of this section to verify project requirements, coordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.

B. Coordinate with work of other sections that is to be installed over, or anchored to, the continuous insulation (CI) framing system, including but not limited to structural anchors, claddings and cladding anchors, utilities, insulation, and firestopping.

1.03 DEFINITIONS

A. Clipped Continuous Insulation (CI) Framing System: An engineered “fixing” system of framing designed to support building veneers on metal girts, transmitting all structural loads through insulation to the wall substrate via intermittent, thermally-isolated clips while maintaining required thermal performance of the wall.

1.04 SUBMITTALS

A. Product Data: Provide product data for factory fabricated continuous insulation (CI) framing members and each accessory product.

B. Shop Drawings: Indicate component details, including sizes, depths, and thicknesses of clips, girts, rails, and accessories or items required of related work.

1. Indicate cladding joint layout, with CI framing system clip and girt layout and spacing coordinated for proper anchorage and support.

2. Indicate anchorage details including mechanical fasteners for securing CI framing system to primary structural wall element.
    a. Indicate supplemental framing and reinforcing as required due to structural calculations.
3. Design Data: Include calculations for loadings and stresses of factory fabricated CI framing for project specific claddings and loadings, signed and sealed by a professional structural engineer.

C. Thermal Modeling Report: Provide test data indicating reduction of R-value of continuous insulation due to framing penetrations. Test data shall demonstrate, at minimum, compliance with ANSI/ASHRAE 90.1 U-factor requirement for walls of construction indicated.

D. Test Reports: Provide test reports performed by a qualified testing agency, for structural anchors, mechanical fasteners, framing clips, and accessories.

E. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

F. Designer's Qualification Statement.

G. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design CI framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Installer Qualifications: Company specializing in exterior/envelope wall systems installation, experienced in the erection and installation of CI framing systems with a history of successful in-service use.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in factory-provided protective coverings and packaging.

B. Protect materials against damage during transit, delivery, storage, and installation at site.

C. Prior to installation, store materials and components under cover in a dry, clean location.

D. Protect CI framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

1.07 WARRANTY

A. Warranty: Installer's warranty against failures in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion. Failures include structural cracks or punctures, material deterioration, and workmanship.
    1. Warranty Period: Two years beginning at the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Continuous Insulation (CI) Framing Systems: Provide complete system including manufacturer's supplementary girts/rails and other required accessories with bracket system indicated.
    1. Aluminum Systems:
        a. ECO Cladding; Sigma Bracket.
        b. GIP GmbH; VECO-A.

c. Hilti; FOX VI.
d. SFS intec Ltd. / NVELOPE Rainscreen Systems Ltd.; NV1 Bracket.

2. Steel Systems:
a. Exo-Tec Manufacturing, Inc; Stand-Off MPV Bracket.
b. GIP GmbH; VECO-G.
c. Knight Wall Systems; MFI D-Series.
d. Northern Facades; ISO Clip.

3. Substitutions: Refer to Section 016000 - Product Requirements.

2.02 CONTINUOUS INSULATION (CI) FRAMING SYSTEM

A. Provide primary and secondary framing members (girts and rails), bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide complete CI framing system, capable of supporting indicated exterior finish cladding(s) in a "rainscreen" design when anchored to indicated structural substrates. System shall consist of thermally isolated brackets supporting vertical girts. Where necessary due to cladding orientation or engineered design, vertical girts shall support horizontal rails. Design shall have the following characteristics:

1. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
2. Design Loads: Refer to Structural Drawings for wind and live loads.
3. Spacing and types of girts and rails shall be as required by cladding manufacturer to support each indicated type of cladding.
a. Coordinate with cladding manufacturer(s) for dead loads of cladding system(s).
b. Coordinate with indicated joint layouts to ensure secondary girts are spaced to provide appropriate structural attachment for cladding(s).
c. The primary material of the bracket and girt components shall be steel or aluminum. Products fabricated of fiberglass or a composite material are not acceptable.
4. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
5. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

C. Thermal Performance: System shall obtain effective R-value or U-factor indicated.

1. Continuous framing profiles fully penetrating insulation are not allowed. Metal framing shall not thermally bridge exterior and interior except for fasteners.
2. Framing assembly shall not reduce continuous insulation nominal R-value to less than 90% effective R-value.
3. Continuous insulation framing system shall be thermally modeled to demonstrate, at minimum, compliance with ANSI/ASHRAE 90.1 maximum U-factor for walls.

D. Flatness: Installed system and components shall be flat within the tolerances allowable by cladding manufacturer; with no noticeable warping, buckling, deflections, or other surface irregularities that distort cladding.

E. Heat Resistance: All components that will come into contact with spray foam insulation shall be capable of exposure to the heat generated by spray foam installation without damage, including plastic washers and thermal spacers. Plastics and resins shall be rated for exposure to temperatures of 300 degrees Fahrenheit or more intermittently without loss of structural capacity or integrity.

F. Ventilation: System design shall allow for movement of air in the cavity behind the cladding, including compartmentalization and/or cross-ventilation for a pressure-equalized system where indicated.

G. Drainage: System design shall allow for drainage of moisture from the cavity behind the cladding.

H. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with Code of Standard Practice.

I. Shop fabricate framing system to the greatest extent possible.

J. Deliver to project site in largest practical sections.

2.03 CONTINUOUS INSULATION FRAMING MATERIALS

A. Steel Framing: Either ASTM A792/A792M aluminum-alloy coated steel or ASTM A1046 zinc-aluminum-magnesium alloy coated steel.

B. Aluminum Framing: ASTM B209/B209M, Alloy 6061-T6 for plate and sheet and ASTM B221, Alloy 6063-T6 for extrusions.

C. Brackets: To suit girts and cladding system loads, and providing for field adjustment of girts to maintain plane of cladding. Provide fixed or floating type as required to accommodate expansion. Provide brackets of depths required for total wall thickness and cavity sizes indicated on Drawings, including adjustable or custom brackets as required.

D. Girts: As required to suit anchoring of perpendicular rails. Provide either vertical or horizontal girts as required due to indicated orientation of cladding.

1. Perpendicular Rails: Subframing rails mounted to girts, to meet the requirements of cladding manufacturer for support and attachment at cladding ends and joints, and for regular spacing for attachment of claddings.

E. Thermal-Break Pads / Spacers: Minimum 1/8-inch thick; fabricated of stable polymer or resin material that is suitable for loading and for heat resistance indicated, including but not limited to polyoxymethylene (POM) or fiberglass (epoxy- or vinyl ester-based). Polymer pad shall be for thermal break properties only and shall not bear structural loading of cladding materials.

2.04 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Type 304 stainless-steel or zinc-plated with electrodeposition coating per ASTM B633 or ASTM F1941/F1941M.

B. Anchorage Devices: Drilled expansion bolts or chemical anchors; Alloy Group 1 stainless steel per ASTM F593 for bolts and ASTM F594 for nuts.

2.05 ACCESSORIES

A. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

B. Protective Coating: Provide corrosion protection coating on concealed aluminum surfaces in contact with cementitious materials or dissimilar metals.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION

A. Install components in accordance with manufacturers' instructions.

B. Attach primary brackets prior to application of spray foam insulation/air barrier. Install brackets true to line with secure connections to primary structural components, at spacing required by load calculations and as indicated on Shop Drawings.

C. After installation of spray foam insulation/air barrier, remove only amount needed for attachment of secondary girts/rails and cladding support anchors. Notify spray foam installer if amount of material removed affects wall's insulating or air/vapor barrier performance, or if touch up is required.

D. Install framing girts/rails plumb, square, and true to line, with securely fastened connections.

1. If cutting is required, cut by sawing or shearing, do not torch cut. Protect adjacent surfaces from sparks.
2. Fasten CI framing members by screw fastening. Locate all mechanical fasteners as indicated on Shop Drawings.
3. Locate screws at slotted holes to allow for expansion and contraction in the CI framing system design.
4. Each girt shall be supported by at least two primary support brackets.
5. Do not bridge building expansion joints with CI framing. Independently frame both sides of joints.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/8 inch.

B. Maximum Variation of any Member from Plane: 1/8 inch, unless otherwise indicated by cladding manufacturer.

3.04 REPAIR AND PROTECTION

A. Touch up shop-applied coatings as required if damaged during handling or installation.

B. After installation of primary support brackets, inspect substrates for damage and repair substrate flashings or membranes as required.

C. Provide fine adjustments to CI framing as required immediately prior to cladding installation to verify that tolerances are maintained. Prepare CI framing in a timely manner to avoid excessive UV exposure to substrate membranes, air barriers, and other materials.

D. Provide final protection of CI framing as required to ensure that CI framing system is without damage or deterioration prior to installation of cladding.

END OF SECTION 054003.13

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel.

L. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

M. NAAMM MBG 531 - Metal Bar Grating Manual.

N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.02 SUBMITTALS

A. Product Data: Provide product data for factory fabricated products and accessory materials, including the following:
   1. Stair nosings.
   2. Nonslip finishes.
   3. Nonshrink grout.
   4. Shop primer paint products.
      a. Coordinate with Division 9 Painting topcoat manufacturer and provide compatibility certificates from topcoat manufacturer that shop primers are acceptable substrate for specified topcoats.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Include field measurements, and indicate where field measurements differ from documents.
2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.03 QUALITY ASSURANCE

A. Design mechanical supports and miscellaneous steel shapes under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Field Measurements: Take field measurements prior to fabrication and verify that dimensions and tolerances are acceptable for fabricated products to fit the space. Indicate field measurements on shop drawings.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials, General: Provide metal fabrications and components with finished surfaces that are smooth and flat. Metal fabrications and components shall not have labels, stickers, engraved or rolled manufacturer names, seams, or blemishes that are exposed in the finished work.

2.02 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Slotted Channel Fittings: ASTM A1011/A1011M.

F. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
1. Provide stainless steel fasteners for all exterior construction and for fastening aluminum and stainless steel fabrications.
2. Provide stainless steel fasteners at areas subject to moisture or steam, including mechanical rooms, janitor/custodial rooms with floor sinks, and similar spaces.
3. Provide zinc-plated fasteners for interior construction except where stainless steel is indicated.

G. Bolts, Nuts, and Washers: ASTM A307, Grade A, galvanized to ASTM A153/A153M where connecting galvanized components.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. Shop and Touch-Up Primer: SSPC-Paint 15, universal shop primer, complying with VOC limitations of authorities having jurisdiction.

J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.03 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.04 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.05 FABRICATED ITEMS

A. Metal Ladders: Refer to Division 5 Section "Metal Ladders".

B. Bollards: Schedule 40 steel pipe, concrete filled, crowned cap, as detailed; nominal 6-inch diameter unless otherwise indicated; prime paint finish.
   1. Where sleeve/cover is not indicated; in lieu of field formed crowned cap, Contractor may at its option provide precast, symmetrically domed caps.
   2. Sleeve/Cover: Cover steel pipe bollard with dome-top low-density polyethylene (LDPE) sleeves designed to fit bollard sizes; with 1/4-inch wall thickness.
      a. Provide with integrally formed decorative top section with 5 horizontal rings; in accordance with basis-of-design product.
      b. Sleeve shall be UV stable and warranted against cracking and fading for at least 5 years..
      c. Provide manufacturer's installation strips or other accessory products required for complete installation.
      d. Color: Color shall be selected by Architect from manufacturer's standard range.
      e. Manufacturers:
         1) Basis-of-Design: TopGard Construction Products; "Lighthouse Decorative Bollard Cover."
         2) Ideal Shield.
         3) Post Guard.

C. Card Reader Pedestals: Provide gooseneck type prefabricated pedestals where indicated, to accommodate card reader. Refer to Drawings for pedestal size, and verify pedestal height with Owner's vehicle fleet.
   1. Coordinate communications and electrical wiring to each pedestal; verify that conduit and wiring is properly sized and placed prior to installation of concrete base pad.
   2. Pedestals shall be installed in concrete footing.
   3. Provide with manufacturer's standard hood accessory to shield devices from weather.
   4. Provide factory powder coated finish; color to be selected by Architect from manufacturer's standard range.

D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking and masonry; prime paint finish.

E. Lintels: As detailed; prime paint finish.

F. Door Frames for Overhead Door Openings: Channel or bent plate sections; prime paint finish.

G. Slotted Channel Framing: Fabricate channels and fittings from ASTM A1011/A1011M, Grade 33 structural steel complying with the referenced standards; with factory-applied, rust-inhibiting thermoset acrylic enamel finish.
   1. Provide 1-5/8 inch by 1-5/8 inch channel unless otherwise indicated.

H. Miscellaneous Steel Shapes: Provide steel shapes for miscellaneous applications indicated on drawings, including but not limited to, reinforcing steel shapes at low partitions/knee walls and concrete slab edge angles.

I. Stainless Steel Bench: 36 inch long by 12 inch wide stainless steel bench, fully welded. Fabricate from 12-gauge Type 304 stainless steel, brushed satin finish. Corners shall be rounded and ground smooth.
   1. Bench thickness/return shall be 1-1/2 inch high.
   2. Provide two pedestals of 2 inch nominal diameter Schedule 40 Type 304 stainless steel, welded to 1/4-inch thick 8" x 8" flange plates.
   3. Anchor each flange to floor slab with four 1/2-inch stainless steel concrete wedge anchors; 2-1/2 inch embedment into floor slab.

2.06 FACTORY FABRICATED STAIR NOSINGS

A. Factory Fabricated Stair Nosings: For casting into concrete stairs.
   1. Materials: Extruded aluminum, alloy type 6063-T5, mill finish.
      a. Tread Abrasive Filler: Aluminum-oxide epoxy-bonded to tread base.
      b. Tread Type: Ribbed bar.
      c. Nosing Types: Angled long nose for sloped stairs.
      d. Color: Black.
      e. Depth: 3 inches nominal.
   2. Manufacturers:
      a. Balco, Inc.; R-315PC.
      b. Nystrom, Inc; Ribbed Bar Nosing with EcoTread (STSB-ECO).
      c. Wooster Products, Inc.; Type 231BF.
      d. Substitutions: See Section 016000 - Product Requirements.

2.07 ENCLOSURE GATES

A. Enclosure Gates: Fabricate gate assembly, including steel gate posts, gate leaves, infill panels, and hardware, in configuration indicated. Galvanize all steel components.
   1. Gate Posts: Provide Schedule 80 steel pipe gate posts, unless indicated otherwise. Close tops of posts with cap plates, welded and ground smooth.
   2. Gate Framing: Provide 3-inch by 3-inch steel angle or bent plate for perimeter and intermediate framing of gates. Fabricate framing by welding; grind joints smooth.
   3. Provide all necessary bracing and reinforcement as required for square, level, and flush operable gates.
   4. Provide all fasteners, accessories, and hardware for a complete and operable gate assembly, unless indicated otherwise.
   5. Infill Panels: Provide prefabricated galvanized steel vision screen assembly for 100% visual screening. Infill panels may be secured to gate framing by welding or by mechanical attachments. If using fasteners, fasteners shall be concealed along sides of framing, with smooth exposed heads. Do not fasten to front faces of frame.
      a. Products:
         1) Ametco Manufacturing Corporation; Shadow 100.
         2) Barnett Bates; Orsogril Talia 100.

3) Substitutions: See Section 016000 - Product Requirements.

6. Hardware: Provide the following:
   a. Barrel Hinges: Exterior grade, weld-on type with grease fitting, of mild steel with stainless steel pin. Size to suit weight of gate, but rated not less than 600 pounds per hinge. Provide a minimum of two per gate leaf, unless indicated otherwise.
   b. Pulls: Bent, 1/4-inch by 1-inch galvanized steel bar stock, welded to frame. Minimum 6-inch high by 2-inch deep pull. Provide one at each gate leaf, vertically mounted.
   c. Staple and Hasp: To suit a standard padlock. Padlock is NIC.
   d. Cane Bolts: Minimum 30 inch length, with attachment hangers/brackets that hold bolts in retracted position, and with a weld pin positioned to prevent cane bolt from being accidentally removed from lower bracket. Provide one per gate leaf. Provide receiver cups for each gate leaf in both the closed and 90 degree open positions, to allow for gates to be held open. Fill spaces around receiver cups with non-shrink grout.

2.08 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize and do not prime items to be embedded in concrete and items to be embedded in masonry. Do not prime items to be embedded in sprayed fireproofing.

B. Prepare interior items to be primed in accordance with SSPC-SP3 Power Tool Cleaning.

C. Prepare exterior items to be primed, and interior items to receive specialty protective coating such as zinc-rich primer, in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning.

D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

E. Prime Painting: One coat.

F. Galvanizing: Galvanize after fabrication to ASTM A123/A123M requirements.

G. Slotted Channel Framing: ASTM A1011/A1011M Grade 33; coated with manufacturer's standard rust-inhibitive acrylic enamel.

2.09 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I color anodized.

B. Apply corrosion protection coating to concealed aluminum surfaces in contact with cementitious material or dissimilar metals.

2.10 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

F. Installation of Nosings: Center nosings on stair width with 4 inch inset at each end. Embed nosings in wet concrete, flush to top of each tread and aligned to front edge of each riser. Coordinate with concrete installer to tool concrete around the nosings for a smooth, clean finish. Remove protective masking tape after concrete has set and cured and clean any concrete residue.

G. Installation of Bollards: Anchor bollards in concrete footings to a minimum depth of 36 inches with 6 inches of concrete below bottom of bollards. Fill bollards with concrete.

1. At Contractor's option, provide either precast caps secured to wet concrete fill, or field-mound wet concrete fill to form a rounded cap.

H. Installation of Gates: Anchor gate posts in concrete footings, to a minimum depth of 36 inches with 6 inches of concrete below bottom of posts.

1. Install gate leaf assemblies to smoothly operate without sagging or binding.
2. Install all hardware for proper operation. Drill cores into concrete apron and install cane bolt receiver sleeves into cores flush with grade. Fill spaces around gate posts and cane bolt receivers with non-shrink grout.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055000

SECTION 055100
METAL STAIRS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

I. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

J. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

K. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

L. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

N. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel.

P. NAAMM AMP 510 - Metal Stairs Manual.

Q. NAAMM MBG 531 - Metal Bar Grating Manual.

R. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual.

S. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's product data for metal stairs.
   1. Provide data for shop primer and for nonshrink grout.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Design Data: Include delegated-design shop drawings, including structural calculations and details for loadings and stresses, and anchors and connections.
   3. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Designer's Qualification Statement.

1.03 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

C. Indoor Emissions: For each type of paint and coating, comply with the emissions requirements of California Department of Public Health (CDPH); "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers."

D. VOC Content: For each type of paint and coating, comply with VOC content restrictions as required by 40 CFR 59, Subpart D (EPA's "National Volatile Organic Compound Emission Standards for Architectural Coatings").

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
      a. Head Clearance: Maintain a minimum of 80 inches head clearance along all paths of travel (the "walk line") as measured above stair noses or finished walking surfaces.
   2. Structural Design: Provide complete stair and railing assemblies that comply with the following:
      a. Stair Capacity: Uniform live load of 100 lb/sq ft and a concentrated load of 300 lb with deflection of stringer or landing framing not to exceed 1/360 of span.
         1) Deflection shall not exceed 1/720 of span where brittle finish materials such as stone, ceramic tile, or terrazzo are indicated.
      b. Railing Assemblies: Refer to Division 5 "Pipe and Tube Railings."
   3. Dimensions: As indicated on drawings.
   4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels, per NAAMM AMP 510 "Metal Stairs Manual":
   1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
      a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
      b. Welds Exposed to View: Ground smooth and flush.
      c. Mechanical Joints: Butted tight, flush, and hairline.
      d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
      e. Exposed Edges and Corners: Eased to small uniform radius.
      f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 1-1/2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch minimum.
   4. Concrete Reinforcement: Welded wire mesh.
   5. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
   1. Nosing Depth: Not more than 1-1/2 inch overhang.
   2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.
   1. Stringer Depth: 10 inches.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported by steel framing members and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.

2.03 METAL STAIRS WITH GRATING TREADS (ADA COMPLIANT)

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Open.

C. Treads: Steel bar grating, with 1/2-inch maximum open space between grating bearing bars, and 4-inch o.c. between grating crossbars. Provide with steel angle/bent plate at each end to support and provide connection to stringers.
   1. Fabricate bar gratings in accordance with NAAMM MBG 531 "Metal Bar Grating Manual."
      a. NAAMM Designation: 11-W-4 Steel.
   2. Grating Type: Welded.
   3. Bearing Bar Size: 1 inch high by 3/16-inch thick.

4. Top Surface: Serrated/abrasive.
5. Nosing: Abrasive steel plate; 1-1/4 inch wide nominal.
6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.

D. Stringers: Rolled steel channels.
1. Stringer Depth: 10 inches.
2. End Closure: Sheet steel, 14 gauge, 0.075 inch minimum; welded across ends.

E. Landings/Platforms: Same construction as treads, with perimeter framing and integral nosing; supported and reinforced as required to achieve design load capacity.

F. Railings: Steel pipe railings.

G. Finish: Galvanized after fabrication.

2.04 METAL STAIRS WITH GRATING TREADS (NON-ADA COMPLIANT)

A. Jointing and Finish Quality Level: Industrial, as defined above.

B. Risers: Open.

C. Treads: Steel bar grating, with 1-3/16 inch maximum openings between grating bearing bars, and 4-inch o.c. between grating crossbars. Provide with steel angle/bent plate at each end to support and provide connection to stringers.
1. Fabricate bar gratings in accordance with NAAMM MBG 531 "Metal Bar Grating Manual."
a. NAAMM Designation: 19-W-4 Steel.
2. Grating Type: Welded.
3. Bearing Bar Size: 1 inch high by 3/16-inch thick.
4. Top Surface: Serrated/abrasive.
5. Nosing: Abrasive steel plate; 1-1/4 inch wide nominal.
6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.

D. Stringers: Rolled steel channels.
1. Stringer Depth: 10 inches.
2. End Closure: Sheet steel, 14 gauge, 0.075 inch minimum; welded across ends.

E. Landings/Platforms: Same construction as treads, with perimeter framing and integral nosing; supported and reinforced as required to achieve design load capacity.

F. Railings: Steel pipe railings.

G. Finish: Galvanized after fabrication.

2.05 HANDRAILS AND GUARDS

A. Handrails and Guards: See Section 055213.

2.06 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.

E. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).

2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

F. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

G. Gratings: Bar gratings that comply with NAAMM MBG 531 or NAAMM MBG 532, whichever applies based on bar sizes.

H. Reinforced Concrete Fill: Refer to Section 033000.

2.07 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15 or MPI #79, compatible with topcoat indicated in Division 9 Section "Painting," and comply with VOC limitations of authorities having jurisdiction.

1. At exterior and galvanized surfaces, provide zinc-rich primer; SSPC-Paint 20 or MPI #20, compatible with topcoat, and VOC-compliant.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 or MPI #20, compatible with topcoat, and comply with VOC limitations of authorities having jurisdiction.

E. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

1. Grout: Comply with ASTM C1107/C1107M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION 055100

SECTION 055133
METAL LADDERS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.

B. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel.

M. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

N. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.02 SUBMITTALS

A. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

B. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

C. Designer's Qualification Statement.

1.03 QUALITY ASSURANCE

A. Design ladders under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40.

E. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

F. Bolts, Nuts, and Washers: ASTM A307, galvanized to ASTM A153/A153M where connecting galvanized components.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED LADDERS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; galvanized finish. Provide mounting brackets at top and bottom of ladder and at no more than 60 inches o.c. For elevator pit ladders, comply with requirements of ASME A17.1.
   1. Side Rails: 5/8 by 2-1/2 inch members spaced at 18 inches.
   2. Rungs: 3/4 inch diameter solid round bar spaced 12 inches vertically on center.
      a. Cover top of each rung with a non-slip coating or with a premanufactured nonslip cover.
      b. Space rungs with a minimum perpendicular clear space of 7 inches from wall surface.
         1) Provide minimum 4.5 inch clear space behind rungs on elevator pit ladders. Coordinate sizing with elevator manufacturer for hoistway cab and clearance requirements.

2.04 FINISHES - STEEL

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Masonry Walls: Confirm that masonry wall assemblies provide adequate structural support for anticipated ladder loads.

C. Metal Framed Walls: Confirm that blocking and reinforcing have been installed in appropriate locations in the wall assembly to provide adequate structural support for anticipated ladder loads.

3.02 PREPARATION

A. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on shop drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055133

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

D. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's product data for pipe and tube railings.

B. Sustainability Submittals: Refer to Division 1 Section "Sustainable Design Requirements."

C. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
2. Design Data: Include delegated-design shop drawings, including structural calculations and details for loadings and stresses, and anchors and connections.
3. Include the design engineer's seal and signature on each sheet of shop drawings.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

E. Designer's Qualification Statement.

1.03 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

C. Indoor Emissions: For each type of paint and coating, comply with the emissions requirements of California Department of Public Health (CDPH); "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers."

D. VOC Content: For each type of paint and coating, comply with VOC content restrictions as required by 40 CFR 59, Subpart D (EPA's "National Volatile Organic Compound Emission Standards for Architectural Coatings").

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 50 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.

F. Provide brackets, flanges, anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

1. For anchorage to concrete or solid masonry, provide brackets anchored with drilled in expansion shields and hanger or lag bolts.
2. For anchorage to hollow masonry, provide brackets anchored with toggle bolts.
3. For anchorage to stud walls, provide brackets anchored with hanger or lag bolts to fire-retardant-treated wood blocking, or with toggle bolts to steel reinforcing backing plates.
    a. Coordinate anchorage locations with Division 6 "Rough Carpentry" and / or Division 9 "Cold-Formed Steel Framing - Non-Structural (CFSF-NS)" to provide blocking or backing plates in framed walls, as applicable.

G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M Grade B Schedule 40; unless otherwise required due to structural loading/design.

1. Provide galvanized pipe at exterior locations, and where indicated.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: No exposed bolts or screws.

E. Galvanizing: In accordance with requirements of ASTM A123/A123M.

F. Shop and Touch-Up Primer: SSPC-Paint 15 or MPI #79, compatible with topcoat indicated in Division 9 Section "Painting," complying with VOC limitations of authorities having jurisdiction.

1. At exterior and galvanized surfaces, provide zinc-rich primer; SSPC-Paint 20 or MPI #20, compatible with topcoat, and VOC-compliant.

G. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055213

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

D. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

E. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. AWPA U1 - Use Category System: User Specification for Treated Wood.

H. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

I. EPA (TSCA); Title VI - Toxic Substances Control Act, Title VI: Formaldehyde Standards for Composite Wood Products.

J. PS 1 - Structural Plywood.

K. PS 20 - American Softwood Lumber Standard.

L. SCAQMD 1168 - Adhesive and Sealant Applications.

1.02 SUBMITTALS

A. Product Data: Provide technical data for fire-retardant materials, wood preservative materials, and include certification that materials and treatment comply with manufacturer's requirements.

1. Evaluation Reports: Provide ICC-ES evaluation reports for each applicable item below:
    a. Preservative-treated lumber.
    b. Fire-retardant-treated lumber.

1.03 QUALITY ASSURANCE

A. Testing Agency Qualifications (for Fire-Retardant Treatments): Independent firm specializing in performing testing of treatments of type specified in this section, and performing periodic inspections to ensure that the material receiving the classification marking matches the tested material; and approved by local authority having jurisdiction.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Grading Agencies: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org and who provides grading service for the species and grade specified.
      a. Northeastern Lumber Manufacturer's Association (NELMA) - Spruce-Pine-Fir.
      b. Southern Pine Inspection Bureau (SPIB) - Southern Pine.
      c. West Coast Lumber Inspection Bureau (WCLIB) - Douglas Fir, Hem Fir, Spruce-Pine-Fir-South.
      d. Western Wood Products Association (WWPA) - Douglas Fir, Hem Fir; Spruce-Pine-Fir-South.
      e. National Lumber Grades Authority (NLGA) - Douglas Fir-North, Hem Fir-North, Spruce-Pine-Fir.
   2. Provide lumber stamped with grade mark of responsible grading agency, unless otherwise indicated.
      a. Place grade stamp on unexposed surface of lumber specified to be exposed with natural or stained finish, or omit grade stamp and submit documentation from grading agency certifying grade compliance.
   3. Species and Grade:
      a. Species and grade is indicated on Structural Drawings for studs, joists, rafters, beams, columns, ceiling joists, and other structural components, as applicable.
      b. For miscellaneous lumber including non-structural miscellaneous framing, blocking, nailers, grounds, and furring, provide No. 2 or Standard grade.
      c. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
   4. Moisture Content: S-dry or MC19 (19% or less). Applies to lumber for 2-inch nominal thickness and less.

B. Composite Wood: Any composite wood materials installed inside the weatherproofing system shall meet either EPA (TSCA); Title VI for ultra-low-emitting formaldehyde or no added formaldehyde (ULEF / NAUF).

2.02 WOOD CONSTRUCTION PANELS

A. Roof Sheathing (Parapet): Exposure 1, veneer faced FRT plywood sheathing. OSB is not acceptable.
   1. Thickness: Minimum 5/8 inch.
   2. Screws for fastening plywood sheathing over rigid insulation at parapets:
      a. For Masonry Backup: 1/4-inch diameter, low-profile flat head type concrete screw anchors at 3 inches from each panel edge, and at spacing indicated. Length to suit embedment into CMU of 1-1/4 inches, minimum.
         1) Pullout Capacity: 100 lb minimum at 1 inch embedment in face shell of hollow CMU.

B. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 1/2 inch, unless otherwise indicated.
   1. Type X Sheathing: At all fire-rated assemblies and at all locations where 5/8-inch thick sheathing is indicated on Drawings, provide 5/8-inch thick product with Type X core. For rated assemblies, product shall be one of those required by indicated tested assembly.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. Edges: Square.
4. Products:
    a. CertainTeed Corporation; GlasRoc Brand.
    b. Georgia-Pacific Gypsum; DensGlass Sheathing.
    c. National Gypsum Company; Gold Bond eXP Sheathing.
    d. USG Corporation; Securock Brand Glass-Mat Sheathing.
    e. Substitutions: See Section 016000 - Product Requirements.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 25 or less, when tested in accordance with ASTM E84 (Class A - UL FR-S).

2.03 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Provide hot-dipped galvanized steel complying with ASTM A 153 or stainless steel at exterior, high humidity, and preservative-treated wood locations.
    a. Fasteners at interior FRT shall be per FRT treatment manufacturer's recommendations.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
3. Anchors: Toggle bolt type for anchorage to hollow masonry.
4. Screws/Anchors for Fastening Top-of-Parapet Blocking & Nailers and for Back-of-Parapet Plywood Sheathing over Rigid Insulation:
    a. For CMU Parapets: Provide 1/4-inch diameter low-profile flat head type concrete screw anchors, at spacing indicated. Length to suit embedment into CMU of 1-1/4 inches minimum. Pullout capacity of 100 lb minimum at 1 inch embedment in face shell of hollow CMU.

B. Flexible Flashing/Separation Material: Barrier sheet fabricated of polyethylene backed rubberized asphalt or butyl rubber sheet; not less than 25 mil overall thickness.

C. General Purpose Construction Adhesives: Comply with ASTM C557 or ASTM D3498.
1. Adhesives: Adhesives field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

2.04 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Provide FRT lumber and plywood stamped with name and mark of qualified testing agency, fire-retardant treatment product and manufacturer, wood species and drying method, testing standards, and flame spread and smoke development indices.
    a. For exterior FRT and FRT that will be exposed to moisture, include accelerated weathering test language, with the words "No increase in the listed classification when subjected to Standard Rain Test ASTM D2898".
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 and maximum smoke developed index of 450, when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
    a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    b. Treat exterior rough carpentry items associated with roof construction, concealed blocking, and as indicated on Drawings.
    c. Do not use treated wood in direct contact with the ground.
2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 and maximum smoke developed index of 450, when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
    a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    b. Treat interior concealed blocking, plywood backing panels, and other rough carpentry items as indicated.
    c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
3. Strength Adjustments (Structural Panels/Plywood): Test FRT structural panels/plywood per ASTM D 5516 and develop strength adjustment factors per ASTM D 6305.
4. Strength Adjustments (Lumber): Test FRT lumber per ASTM D 5664 and develop strength adjustment factors per ASTM D 6841.

C. Preservative Treatment:
1. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA). Do not use lumber or plywood treated with inorganic boron (SBX) for applications exposed to water, ground/soil contact, or interior floor slabs/concrete. Comply with additional treatment restrictions as required by local authorities having jurisdiction.
2. Preservative Pressure Treatment of Lumber & Plywood Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
    a. Use Category UC2 is acceptable for interior lumber and plywood above grade (not in contact with floor slab).
    b. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
    c. Treat lumber exposed to weather.
    d. Treat lumber in contact with roofing, flashing, or waterproofing.
    e. Treat lumber in contact with masonry or concrete.
    f. Treat lumber less than 18 inches above grade, and lumber located directly against below-grade exterior walls.
    g. Treat lumber in other locations as indicated.
3. Preservative Pressure Treatment of Lumber in Contact with Ground/Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
    a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In metal-framed walls, provide continuous FRT blocking around door and window openings for anchorage of frames, securely attached to stud framing.

C. In metal-framed walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where PPT blocking is indicated to be installed directly adjacent to metal decking or other galvanized metals, provide flexible flashing/separation material as a continuous barrier to prevent direct contact between materials.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Top-of-Parapet Blocking and Nailers: Secure wood blocking and plywood nailers to prepared substrate using mechanical fasteners to attain loading design requirements. Adhesive anchorage of wood nailers & blocking is not acceptable. Coordinate with installation of continuous insulation and air barrier membrane/roof membrane materials.

1. Installation at CMU Parapets: Secure parapet blocking and nailers to CMU with screw anchors in two rows, staggered, at 32 inches on center; except within 10 feet of building corners provide two staggered rows at 24 inches on center. Provide fasteners sized for embedment length into CMU of 1-1/4 inch, minimum. Install screws in accordance with manufacturer's instructions, with screw heads flush with uppermost surface off indicated blocking or plywood nailer.

C. Back-of-Parapet Sheathing Over Rigid Insulation: Secure plywood sheathing over XPS / XEPS insulation to prepared substrate using mechanical fasteners to attain loading design requirements. Adhesive anchorage is not acceptable. Coordinate with installation of continuous insulation and air barrier membrane/roof membrane materials.

1. Stagger vertical butt joints of plywood sheathing.
2. Installation at CMU Parapets: Secure sheathing over board insulation with screw anchors, embedment length of at least 1-1/4 inches into CMU substrate. Fastener spacing shall be 16 inches horizontally and 8 inches vertically.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws as indicated.

1. Screw panels to cold-formed steel framing.
2. Space panels 1/8-inch apart.

B. Communications and Electrical Room Mounting Boards: Secure with screws, to furring or to framing as applicable, with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and in field of board.
1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.

3.06 CLEANING

A. Waste Disposal: Refer to Section 017419 - Construction Waste Management and Disposal.
1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 061000

SECTION 064100
ARCHITECTURAL WOODWORK AND CASEWORK

PART 1 GENERAL

1.01 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.02 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard.

B. ANSI A208.1 - American National Standard for Particleboard.

C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

D. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. AWI (QCP) - Quality Certification Program.

G. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

H. BHMA A156.9 - Cabinet Hardware.

I. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

J. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

K. EPA (TSCA); Title VI - Toxic Substances Control Act, Title VI: Formaldehyde Standards for Composite Wood Products.

L. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.

M. NEMA LD 3 - High-Pressure Decorative Laminates.

N. SCAQMD 1113 - Architectural Coatings.

O. SCAQMD 1168 - Adhesive and Sealant Applications.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

A. Product Data: Component dimensions, configurations, construction details, joint details, attachments.
   1. Include product data for each type of hardware and accessory.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Include field measurements, and indicate where field measurements differ from documents.

C. Selection Samples: Submit manufacturer's color charts indicating full range of available colors, for each product requiring color selection.

D. Verification Samples: Submit physical samples, manufacturer's standard size, for each specified finish and color of the following materials:
   1. For each type of architectural woodwork profile and paneling, minimum 8 inches square or 8 linear inches in length, illustrating proposed shapes, sizes, and finishes of panels, moldings, and other profiles
   2. For each solid wood or wood veneered product indicated to receive transparent finish, provide at least three samples illustrating standard range of wood grain, stain color, and sheen, for selected color.
   3. Plastic laminate **[PLAM].**
   4. Solid surface **[SSM]**.
   5. Simulated stone quartz **[QSM]**.
   6. PVC edge banding.

E. Fabricator Qualifications: Include evidence of accreditation with quality control program.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with experience on Projects of similar size and scope.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.
      a. It is acceptable to subcontract portions of the work to a separate specialty subcontractor (for example, pre-fabricated plastic-laminate-faced casework); however, each fabricator shall be independently accredited; submit accreditation for each fabricator. The primary woodwork contractor shall be responsible for ensuring the work of all Division 06 sections is well coordinated and properly fabricated and installed.

B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
      a. This AWI (QCP) project is registered as project number 26.0860.
   2. Provide for third-party AWI final inspection of fabricated architectural casework (prior to delivery). AWI program of self-certification in lieu of third-party inspection is not acceptable.
   3. Provide for third-party AWI final inspection of field-installed woodwork (after installation). AWI program of self-certification in lieu of third-party inspection is not acceptable.
   4. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
   5. Provide designated labels on shop drawings as required by certification program.
   6. Provide designated labels on installed products as required by certification program.
   7. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   8. Replace, repair, or rework all work for which certification is refused.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 2 of the Architectural Woodwork Standards: "Care & Storage."

B. Deliver woodwork after finishes are complete, including painting, and HVAC is operating at occupancy conditions in all spaces where woodwork will be installed.

C. Store in an environmentally controlled location. Protect units from moisture damage.

1.07 FIELD CONDITIONS

A. During and after installation of woodwork, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84, unless otherwise indicated for specific products.

C. All countertop surfaces shall be NSF approved for food contact.

D. Accessibility Requirements: Fabricate and install woodwork and casework in compliance with ICC/ANSI A117.1 and with ADA Standards for Accessible Design.

E. Low-Emitting Materials:

1. Composite Wood: Any composite wood materials installed inside the weatherproofing system shall meet either EPA (TSCA); Title VI for ultra-low-emitting formaldehyde or no added formaldehyde (ULEF / NAUF).
2. Paints and Coatings: Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.
3. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

2.02 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Plastic-Laminate-Clad Cabinets: Custom grade, except as modified below. Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base and tall cabinets.

1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
   a. Base Cabinets: 24 inches.
   b. Tall Cabinets: 24 inches.
   c. Wall Cabinets: 12-1/2 inches. (Minimum clear interior depth shall be 11 inches)
3. Drawer Construction: Provide AWI premium grade for drawer box construction.

4. Base Construction: Provide adjustable levelers for all base cabinets to facilitate load transfer to the floor, isolate cabinet ends from the floor, and permit leveling.
    a. Provide one of the following two types of base construction:
        1) Separate Sub-Base: Cabinet sub-base shall be separate and continuous (no cabinet body sides-to-floor), exterior grade plywood with concealed fastening to cabinet bottom. Sub-base shall be ladder-type construction of individual front, back, and intermediates, to form a secure and level platform to which cabinets attach. Recess sub-base at exposed cabinet end panels 1/4 inch from face of finished end, for flush installation of finished base material by other trades.
        2) Integral Base: Provide end panels, cabinet bottoms, and horizontal toe kick members integrally joined together for structural strength. Adjustable levelers shall be provided at each corner for each cabinet.
    b. Toe Kick: Toe kick shall be nominal 4 inch height. Reduce as necessary via field modification due to construction tolerances and concrete slab levelness to maintain maximum height dimensions indicated.
5. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
    a. Finish: Matte or suede, gloss rating of 5 to 20.
    b. Surface Color and Pattern: To be selected by Architect from manufacturer's full range.
    c. Exposed Interior and Semi-Exposed Surfaces: Provide HPDL, type VGS or CLS, at semi-exposed interiors of cabinets (cabinets with doors) and drawer boxes. Provide type VGS for exposed interior horizontal shelving surfaces and interiors of open cabinets (no doors).
    d. Apply undecorated laminate backing sheet to concealed reverse side of plastic laminate finished surfaces.
    e. Wood Grain Pattern: If wood grain is indicated or selected for plastic laminate color/pattern, provide sequence matched finish across each elevation. Grain shall run vertically across all doors, drawers, fronts, and false fronts; mismatched grain direction is not allowed.

C. ADA Sink Panels: Fabricate a panel of 3/4-inch moisture resistant core material and veneer/cladding material to match adjacent cabinets. Panel shall be removable for service access to undercounter plumbing. Provide with Z-clip attachment system for concealed fastening and with a steel cable retainer, minimum 3 feet long, so that panel can be set aside for service access. Fasten Z-clips and steel cable retainer to panel and to substrate with tamper-resistant fasteners.
    1. Provide an undercounter vertical "apron" piece at front of ADA sink locations as indicated, flush to fronts of adjacent cabinets and finished to match.

2.03 WOOD-BASED COMPONENTS

A. Low-Emitting Materials: Provide composite wood products that meet the requirements of EPA (TSCA); Title VI for formaldehyde emissions.

B. Core Material for Cabinets: ANSI A208.1, Grade M-2 particleboard.
    1. At Contractor's option, cabinet backs may be fabricated of ANSI A208.2, Grade MD fiberboard.

C. Core Material for Countertops: Manufacturer's standard ANSI A208.1, Grade M-2 particleboard, or ANSI A208.2, Grade MD fiberboard.
    1. At countertops containing sinks, provide core material meeting ANSI MR10 for moisture resistance. Available Products:
        a. Arauco North America; Duraflake VESTA Moisture Resistant ULEF.

b. Collins Pine; FreeForm.
c. Georgia-Pacific; Ultrastock MR MDF.
d. Roseburg Forest Products; SkyBlend MR-10.

2.04 PANEL CORE MATERIALS

A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.

B. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.

2.05 THERMALLY FUSED LAMINATE PANELS

A. Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
1. Test in accordance with NEMA LD 3 Section 3.
2. Panel Core Substrate: Particleboard.
3. Color: As selected from manufacturer's standard range of colors.

2.06 LAMINATE MATERIALS

A. Manufacturers:
1. Wilsonart LLC; [High Pressure Laminate (HPL)] **(Basis of Design).**
2. Panolam Industries International, Inc; Nevamar Standard HPL.
3. Panolam Industries International, Inc; Pionite Standard HPL.
4. Formica Corporation; [High Pressure Laminate].

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Color and Pattern: To be selected by Architect from Manufacturer's full range (standard and premium colors) in standard textured finish (textured gloss, fine textured, or suede finish). High gloss, heavy textured, metallic, or other special surface products (abrasion-resistant, chemical-resistant) will not be required for use in this project.

D. Provide specific types as follows:
1. Horizontal Countertop Surfaces: HGS, 0.048 inch (1.2 mm) nominal thickness.
2. Vertical Surfaces and Non-Countertop Horizontal Surfaces: VGS, 0.028 inch (0.7 mm) nominal thickness.
3. Cabinet Liner: CLS, 0.020 inch (0.5 mm) nominal thickness.
4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.07 SOLID SURFACING MATERIAL

A. Solid Surfacing Material **[SSM]**: ISFA 2-01.
1. Products:
a. E. I. du Pont de Nemours and Company; Corian **(Basis of Design).**
b. Avonite Surfaces, a Brand of Aristech Surfaces, LLC; Avonite.
c. Formica Group; Solid Surfacing.
d. Hanwha L&C; Hanex.
e. LG Hausys America; HI-MACS.
f. Lotte Advanced Materials Co. Ltd.; Staron.
g. Meganite, Inc; Meganite Acrylic Solid Surface.

h. US Surface Warehouse; LivingStone.
i. Wilsonart LLC; Solid Surface.

2. Thickness: 1/2-inch.
3. Type: Standard Type.
4. Color and Pattern: To be selected by Architect from manufacturer's full range.
5. Color and Pattern: Provide colors per the following:
   a. Colors and Patterns for Countertops: As selected by Architect from manufacturer's full range of colors equivalent to Dupont Corian price group 4.

2.08 QUARTZ SURFACING MATERIAL

A. Quartz Surfacing (Agglomerate Stone) **[QSM]**: Engineered stone material consisting of approximately 93% quartz aggregate blended with 7% resins, additives, and environmentally safe non-fade pigments.
   1. Products:
      a. E. I. du Pont de Nemours and Company; Corian Quartz **(Basis of Design).**
      b. Cosentino; Silestone.
      c. Cambria.
      d. Hanwha L&C; HanStone.
      e. LG Hausys America; Viatera.
      f. CaesarStone.
      g. Technistone.
   2. Thickness: 20 mm (3/4-inch).
   3. Color and Pattern: As selected by Architect from manufacturer's full line.

2.09 COUNTERTOPS

A. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Custom Grade and with manufacturer's requirements.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
   2. Core: Particleboard or fiberboard as specified, except provide moisture resistant type at sink locations. Build up core material for total countertop thickness indicated.
   3. Exposed Edge Treatment: Square, substrate built up to 1-1/2 inch thick unless otherwise indicated; covered with 3 mm edge banding with eased ends.
   4. Back and End Splashes: 3/4-inch thick core material with Grade HGS face and 0.5 mm edge banding/tape at edges.

C. Solid Surfacing Countertops **[QSM, SSM]** and Window Stools **[SSM]**: Solid surfacing sheet or plastic resin casting over structural substrate/core material.
   1. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   2. Core: Fabricate solid surface countertop core of manufacturer's recommended moisture-resistant MDF. Provide continuous structural substrate at unsupported/overhang conditions; ladder construction acceptable over cabinets. Build up core material for total countertop thickness indicated.
   3. Fabricate in accordance with manufacturer's standard requirements, and in one piece to the greatest extent possible.

a. Shop-fabricate cutouts and holes in solid surface for plumbing fixtures, deck-mounted soap dispensers, and other items indicated on Drawings.

4. Provide manufacturer's standard configuration for exposed edges, back and end splashes, and per the requirements below:
   a. Edge and Corner Profiles: Eased.
   b. Provide built up edges to standard thickness indicated (1-1/2 inches unless otherwise indicated).
   c. Provide 4 inch high back and end splashes, unless otherwise indicated.
5. Window Stools: Scribe window stools to fit jamb conditions as indicated.

2.10 ACCESSORIES & ACCESSORY MATERIALS

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; of width to match component thickness.
   1. Provide 3 mm edge banding at all door and drawer front edges and laminate countertop edges.
   2. Provide 0.5 mm edge banding (tape) at cabinet body edges, shelf edges, and other semi-exposed/exposed interior edges.
   3. Color: To be selected by Architect from Manufacturer's full range.

C. Glass: Type A, see Section 088000.
   1. Location: Adjustable Shelves in Cabinets with Framed Glass Sliding Doors.

D. Tackable Fabric:
   1. Location: Interior Back Panel in Cabinets with Framed Glass Sliding Doors.
   2. **Basis of Design:** Carnegie Xorel Meteor.

E. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

F. Concealed Joint Fasteners: Threaded steel.

G. Casters: Provide swivel type, zinc-plated steel casters unless otherwise indicated. All casters shall include sealed bearings and non-marking, radiused, polyurethane or rubber treads. Do not provide brakes unless specifically indicated; where brakes are indicated or where casters are indicated to be "locking" type, provide brake type that locks both swivel and wheel.
   1. Standard Duty Casters: Wheels with nominal 3-inch diameter, by 1- to 1-1/4-inch width; with a minimum load rating of 150 lbs per caster.
   2. Manufacturers:
      a. Caster City.
      b. Hamilton Caster & Mfg.
      c. R & K Industrial Wheels.

H. Grommets: Standard plastic grommets for countertop cut-outs, in black color unless otherwise indicated.
   1. Grommet Size: To fit 2-1/2 inch diameter cut-out, nominal, unless otherwise indicated.
   2. Grommets shall have removable caps and slot for wire passage.

I. Undercounter Wire Management: Provide the following, as indicated:
   1. Vinyl J-shaped channel wire manager for undercounter mounting, continuous for full length of countertop.

2.11 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated shelf rests, polished chrome finish, for nominal 1 inch spacing adjustments.

C. Workstation Brackets: Fixed, L-shaped, corner reinforced, face-of-stud mounting. Provide at all countertop/worksurface that is unsupported by cabinetry at 16 inches o.c., unless otherwise indicated.
   1. Materials: Formed steel shapes.
      a. Finish: Manufacturer's standard, factory-applied, textured powder coat.
      b. Color: To be selected by Architect from manufacturer's full range.
   2. Load Capacity: 1000 lbs minimum per pair of brackets, tested at 16 inches o.c. spacing.
   3. Size: Provide nominal sizes below. Provide additional sizes as required for other countertop/workstation applications indicated on Drawings.
      a. Provide 21 inches high by 28 inches deep for standard 30 inch deep countertops.
      b. Provide 21 inches high by 21 inches deep for standard 25 inch deep countertops.
   4. Products:
      a. A&M Hardware, Inc; Standard Brackets.
      b. Best Brackets; ADA Workstation Support Standard Steel Bracket.
      c. FastCap; SpeedBrace.
      d. Lyman Associates; Counter Top Supports.
      e. Substitutions: See Section 016000 - Product Requirements.

D. Concealed Shelf Support Brackets: Fabricated of 1/4-inch flat plate steel with 1/4-inch diameter mounting holes in vertical flange, for face mounting into framing substrate. Coordinate with casework fabrication, provide additional shimming and furring to underside of shelf as required for flush installation. Finish color to be selected by Architect from manufacturer's full range.
   1. Material: Steel
   2. Size: Provide minimum 34 inch width for 36 inch shelf.
   3. Load Capacity: Minumum 190 lbs per bracket.

E. Drop-In Deal Tray:
   1. Material: Stainelss Steel
   2. Size: 16 by 12 inches
   3. Overall Height: 1-9/16 inches
   4. Tray Depth: 1-1/2 inches
   5. Shape: Rectangular
   6. Finish: Brushed

F. Drawer and Door Pulls:
   1. Size: 5 inches
   2. Location: Community Room, Kitchen/Break
   3. Finish: Satin or Brushed
   4. **Basis of Design:** Amerock, Bar Pull, Sea Grass

G. Drawer and Door Pulls: BHMA A156.9, B02011, back-mounted "U" shaped wire pull, steel with satin finish, 4 inch centers.
   1. Location: Use this type of pull where no other type of pull is indicated.

H. Sliding Door Pulls: Elongated shape for recessed installation, steel with satin finish.

I. Cabinet and Drawer Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish. Provide on all cabinet doors and drawers unless otherwise indicated.

J. Drawer Slides:
   1. Type: Full extension.
   2. Static Load Capacity: Heavy Duty grade.
      a. For standard box drawers under 30 inches wide, provide BHMA Grade 1HD-100 with minimum load capacity of 100 lbf.
      b. For file drawers and drawers 30 inches wide or larger, provide BHMA Grade 2HD-200 with minimum load capacity of 200 lbf.
      c. For pencil drawer slides, provide 3/4 extension with minimum load capacity of 45 lbf.
   3. Mounting: Side mounted.
   4. Stops: Integral type.
   5. Features: Provide soft close type.
   6. Manufacturers:
      a. Accuride International, Inc.
      b. Fulterer USA.
      c. Grass America Inc.
      d. Knape & Vogt Manufacturing Company.

K. Filing Cabinet Suspension System: Provide 14-gauge steel file suspension rails, epoxy powder coated. File followers, or other split bottom hardware, are not acceptable.

L. Waste/Recycle Bin Slides: Heavy-duty, ball-bearing type slides that bottom mount to inside of cabinet, with integral wire system to hold bins in place. Provide specific model for cabinet width indicated.
   1. Static Load Capacity: Minimum 100 lbs.
   2. Features: Provide with integral stops and soft-close operation.
   3. Products:
      a. Fulterer USA; FR 3607/3608.
      b. Knape & Vogt; SBM/PSW Series.
      c. Hafele; Waste Bin Pull Out.

M. Hinges: European style concealed **soft-closing** type, BHMA A156.9, B01602, steel with satin finish.
   1. Provide minimum 110 degree opening standard, and 160 degree opening at ADA sink base cabinets.
   2. Location: Community Room, Kitchen/Break.

N. Hinges: European style concealed type, BHMA A156.9, B01602, steel with satin finish.
   1. Provide minimum 110 degree opening standard, and 160 degree opening at ADA sink base cabinets.
   2. Location: Use this type of hinge where no other type of hinge is indicated.

2.12 MISCELLANEOUS INTERIOR WOODWORK / CARPENTRY ITEMS

A. Closet and Utility Shelving: Provide 3/4 inch thick panels and cleats with closet rod mounted to cleats below shelf.
   1. Shelf Material: Decorative thermoset panels, with PVC T-mold edge.
   2. Rod and Flange Material: 1-5/16 inch diameter, aluminum tube, with matching flanges.

2.13 FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
   1. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.
   2. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
   3. Seal or prime paint concealed cut edges of wood and laminate casework.

D. Hardware Application: Factory-machine casework members for hardware that is not surface applied.

E. Apron Frames: Construction similar to other cabinets, with modifications.
   1. Frames fabricated from panels standard with the manufacturer. Include front and back panels, with drawer suspension framing mechanically fastened to support channels spanning between them.

F. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel exposed edges.

G. Solid Surfacing: Fabricate in one piece to greatest extent possible; join pieces with adhesive sealant and finish joints smooth in accordance with manufacturer's recommendations and instructions.
   1. Fabricate with butt-jointed / square edge at all solid surface corners. Mitered solid surface corners are not acceptable.

H. Countertop Fabrication: Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall, or as indicated.
   2. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

I. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Height: 4 inches, unless otherwise indicated.
   2. Mechanically fasten back and end splashes to countertops with steel brackets at 16 inches on center.

J. Wall-Mounted Counters (not mounted over cabinets): Provide ADA compliant knee space with brackets, skirts, or aprons, as indicated on Drawings.

2.14 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

C. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:

a. System - 3, Lacquer, Postcatalyzed OR System - 5, Varnish, Conversion.
b. Stain: As selected by Architect.
c. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Environmental Conditions:
   1. Do not deliver woodwork or casework until the following conditions have been met:
      a. Building has been enclosed (windows and doors sealed and weather-tight).
      b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
      c. Ceiling, overhead ductwork, piping, and lighting have been installed.
      d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point, and provide field modifications as required to not exceed maximum height dimensions.
   1. Construction tolerances shall not apply to casework maximum height dimensions; maximum indicated dimension shall be maintained at any point along the length of casework, regardless of floor levelness.
   2. Field modifications shall be made to the toe kick to account for leveling due to floor levelness.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
   1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inchper story.
   2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.

D. Verify adequacy of backing and support framing.

E. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade(s) indicated and in accordance with manufacturer's instructions.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
   2. Variation of Bottoms of Wall Cabinets from Level: 1/8 inch in 10 feet.
   3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.

4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

G. Secure wall cabinets at top and bottom, at each end and no more than 16 inches on center. Secure directly into metal wall framing, or into FRT wood or metal channel blocking with No. 10 wafer head screws. Wall mounted hanger strips are not acceptable.

H. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

I. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Test installed work for rigidity and ability to support loads.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.05 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 064100

SECTION 070150.19
PREPARATION FOR RE-ROOFING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with affected mechanical and electrical work associated with roof penetrations.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1. Attendees:
   a. Architect.
   b. Contractor.
   c. Owner.
   d. Installer.
   e. Roofing system manufacturer's field representative.
2. Meeting Agenda: Provide agenda to participants prior to meeting in preparation for discussions on the following:
   a. Removal and installation schedule.
   b. Necessary preparatory work.
   c. Protection before, during, and after roofing system installation.
   d. Removal of existing roofing system.
   e. Cleaning of existing roofing system indicated to remain.
   f. Installation of new roofing system.
   g. Patching new roofing to existing roofing to remain, where indicated.
   h. Temporary roofing and daily terminations.
   i. Transitions and connection to and with other work.
   j. Inspections and testing of installed systems.

1.03 SUBMITTALS

A. Product Data: Submit for each type of material.

B. Shop Drawings: Indicate size, configuration, and installation details.

C. Installer's Qualification Statement.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

1.05 FIELD CONDITIONS

A. Do not remove existing roofing membrane when weather conditions threaten the integrity of building contents or intended continued occupancy.

B. Maintain continuous temporary protection prior to and during installation of new roofing system.

C. Provide notice at least three days before starting activities that will affect normal building operations.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Coordinate with Division 7 Section "TPO Membrane Roofing" for components of new roofing system to be installed over existing deck.

2.02 MATERIALS

A. Temporary Roofing Protection Materials:
   1. It shall be the Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing roof surface has been cleared of materials being removed from existing roofing system and ready for next phase of work as required.

3.02 PREPARATION

A. Sweep roof surface clean of loose matter.

B. Remove loose refuse and dispose of properly off-site.

3.03 MATERIAL REMOVAL

A. Remove only existing roofing materials that can be replaced with new materials the same day.

B. Remove existing roofing system down to metal deck, including but not limited to membrane, perimeter base flashings, flashings around roof protrusions, pitch pans and pockets and insulation vents, insulation, substrate or cover boards, and air or vapor barrier membranes.

C. After removal of roofing system, examine the existing metal deck for structural integrity and for any signs of damage or deterioration. Provide recommendations to Owner and Architect.

3.04 INSTALLATION

A. Coordinate scope of this work with requirements for installation of new roofing system, refer to Division 7 Section "TPO Membrane Roofing" for installation requirements.

3.05 PROTECTION

A. Provide temporary protective sheeting over uncovered deck surfaces.

B. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights.

C. Provide for surface drainage from sheeting to existing drainage facilities.

D. Do not permit traffic over unprotected or repaired deck surface.

END OF SECTION 070150.19

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. NFPA 259 - Standard Test Method for Potential Heat of Building Materials.

F. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.02 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.03 QUALITY ASSURANCE

A. NFPA 285 Tested Assembly: Provide foam plastic insulation products located in exterior wall assemblies that have been tested in accordance with NFPA 285 which represent those exterior wall assemblies for this Project.

1. Potential heat in Btu per square feet shall not exceed the potential heat of the foam plastic insulation contained in the wall assembly tested as determined by tests in accordance with NFPA 259.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect foam-plastic insulation from physical damage, including chipping, cracking, or soiling. Do not use boards that are damaged due to delivery or handling.

B. Store insulation in a manner that protects from damage or deterioration, including moisture, soiling, or UV exposure.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

B. Coordinate with insulation manufacturer for UV exposure requirements and coordinate the schedule of construction to ensure insulation is concealed in a timely manner.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.

1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.

a. High Strength XPS: Provide Type VI, 40 psi (276 kPa), minimum, where XPS runs horizontally over top of parapet walls, and at other locations as indicated on Drawings.

2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
5. Complies with fire resistance requirements as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.

B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.
1. Classifications:
a. Type I: Faced with aluminum foil on both major surfaces of the core foam.
1) Class 1 - Non-reinforced core foam.
2) Compressive Strength: 20 psi, minimum.
3) Thermal Resistance, R-value: Minimum R-13.0 at 2 inches thick; at 75 degrees F.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Board Size: 48 inch by 96 inch.
5. Board Thickness: 1.5 inch.
6. Products:
a. Atlas Roofing Corporation; EnergyShield Pro.
b. Hunter Panels; Xci Foil (Class A).
c. Johns Manville; AP Foil-Faced.
d. Rmax Inc; ECOMAXci FR.
e. Substitutions: See Section 016000 - Product Requirements.

2.02 BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
3. Facing: Unfaced.

B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.

2.03 MISCELLANEOUS GAP / CRACK FILLER

A. General: Fill miscellaneous joints and cracks with mineral wool batt insulation (specified above) or with closed-cell polyurethane foam at Contractor's option.

B. Closed Cell Polyurethane Foam:
1. Provide insulation that conforms to ULC S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material" or ASTM C 1029, Type II, and performance requirements listed.
2. Flame-spread index of 0 and maximum smoke development index of 5, when tested in accordance with ASTM E84.

3. Products:
    a. Dow; Enerfoam Professional Foam Sealant.
    b. Dupont; Great Stuff Pro Gaps & Cracks.
    c. Hilti; CF-AS Crack and Joint All Seasons.
    d. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

A. Tape joints of rigid insulation in accordance with insulation manufacturers' instructions.

B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

C. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.

B. Apply adhesive to back of boards per manufacturer's instructions, or, at Contractor's option install insulation boards to tacky dampproofing/mortar parge coat before it has cured.

C. Install boards horizontally on foundation perimeter.
    1. Place boards to maximize adhesive/substrate contact.
    2. Install in running bond pattern.
    3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

A. Secure impale fasteners to substrate to manufacturer's required quantity and spacing.

B. Install boards to fit snugly between wall ties.

C. Install boards horizontally on walls.
    1. Install in running bond pattern.
    2. Butt edges and ends tightly to adjacent boards and protrusions.
    3. Place impale fastener locking discs.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 072100

SECTION 072736
SPRAYED FOAM (SPF) AIR BARRIER

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

B. ASTM C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.

C. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.

G. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies.

H. CAN-ULC-S705.1 - Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material Specification.

I. CAN-ULC-S705.2 - Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application.

J. NFPA 259 - Standard Test Method for Potential Heat of Building Materials.

K. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.03 SUBMITTALS

A. Product Data: Provide product description, insulation properties, and preparation requirements.
   1. Provide current Evaluation Service Report upon request.

B. Shop Drawings: Provide project-specific drawings of location and extent of air barrier assemblies.
   1. Provide details for each wall assembly substrate condition. Include field adhesion test value requirements for each substrate indicated.
   2. Provide termination, transition, and joint details. Details shall include methods for maintaining air barrier continuity and continuous insulation (CI). Include specific details for the following:
      a. Bridging of gaps in construction.
      b. Inside and outside corners.
      c. Perimeter of window and door openings.
      d. Sealing around penetrations at pipes, conduits, and boxes.
      e. Spray-stop / screed angle, including transition membrane.
      f. Continuity of air barrier at flashings, ledge and shelf angles, and similar interruptions.

C. Compatibility Data: Provide manufacturer's data indicating compatibility between submitted SPF and transition membrane products.

D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection as required by ABAA QAP.

E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.04 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP):
   1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
      a. Install shall also be certified by ABAA/BPQI (Building Performance Quality Institute) in accordance with the training requirements outlined in the CAN-ULC-S705.2 Installation Standard. Installers shall have their photo-identification certification cards in their possession and available on the project site, for inspection upon request.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

B. NFPA 285 Tested Assembly: Provide foam plastic insulation products located in exterior wall assemblies that have been tested in accordance with NFPA 285 which represent those exterior wall assemblies for this Project.
   1. Potential heat in Btu per square feet shall not exceed the potential heat of the foam plastic insulation contained in the wall assembly tested as determined by tests in accordance with NFPA 259.

1.05 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Integrated Exterior Mockups: Attend preinstallation conference for and provide spray-foam components for integrated exterior mockup as indicated on Drawings and as specified in Division 1 Section "Quality Requirements."

1.06 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

1.07 WARRANTY

A. Material Warranty: Manufacturer's standard warranty against manufacturing defects, for a minimum period of 3 years.

B. Installation Warranty: Air barrier subcontractor's installation warranty, effective from date of Substantial Completion for a minimum period of 2 years. Installation warranty shall include all components of the air barrier assembly, including loss of airtight seal, loss of watertight seal, loss of adhesion, loss of cohesion, or failure to cure properly.

PART 2 PRODUCTS

2.01 MATERIALS

A. Spray Polyurethane Foam (SPF) Air Barrier/Insulation: Medium-density, rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Provide insulation that conforms to CAN-ULC-S705.1 or ASTM C1029, Type II, and performance requirements listed.
   2. Thermal Resistance: R-value of 6.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   3. Density: Minimum 1.9 pounds per cubic foot.
   4. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   5. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
   6. Air Permeance (Material): Not to exceed 0.004 cfm per square foot, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
   7. Ozone Depletion Potential (ODP): Zero.
   8. Closed Cell Content: At least 90 percent.
   9. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   10. Products:
      a. BASF Corporation; WALLTITE US.
      b. Green Valley Products; GVP Pro 2.0 HFO.
      c. Henry Company; Permax 2.0 HFO.
      d. Huntsman Building Solutions; Heatlok HFO Pro.
      e. Johns Manville; JM Corbond IV Close Cell Spray ; JM Corbond IV Closed Cell Spray Polyurethane Foam.
      f. NCFI Polyurethanes; InsulBloc HFO.
      g. Substitutions: See Section 016000 - Product Requirements.

B. Air Barrier Assembly Performance: Air barrier assembly, including primary air barrier and auxiliary materials, including joints and transitions to adjacent materials, shall have an air leakage rate not to exceed 0.04 cfm per square foot, at 1.57 psf pressure differential when tested per ASTM E2357. The air barrier assembly shall also serve as liquid water control layer, and shall be flashed to direct moisture to the exterior.

2.02 ACCESSORIES

A. Compatibility of Materials: Provide sealants, tapes, transition membranes, and other accessory materials that are tested to be compatible with the primary air barrier material and with each other. Provide compatibility charts with product data submittal indicating material compatibility.

B. Primer: As required by insulation manufacturer.

C. Membrane at Transitions in Substrate and Connections to Adjacent Elements: Nominal 40-mil thick, impermeable, self-adhering sheet membrane.
   1. Available Products:
      a. Carlisle Coatings and Waterproofing; CCW-705.
      b. Grace Construction Products; Perm-A-Barrier Flashing.
      c. Henry Company; Blueskin SA.
      d. Polyguard; Airlok Sheet 400 NP.

e. Tremco, Inc.; ExoAir 110.
f. W. R. Meadows, Inc.; Air Shield.

D. Membrane at Transitions between Spray Foam Air Barrier and Roofing and Other Adjacent Materials: Provide impermeable transition membrane that complies with both air barrier manufacturer's recommendations and adjacent material manufacturer's recommendations.

E. Spray Foam Stop and Screed: L-shaped stop and screed designed as a spray foam termination accessory, fabricated of stable UV-resistant plastic and acceptable to spray foam manufacturer. Outer leg shall be sized to match spray foam thickness indicated. "Jam-Ex" by Exo-Tec Manufacturing, Inc., or equivalent product.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete before insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply to the minimum cured thickness indicated on Drawings.

D. Patch damaged areas.

E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

F. Building Expansion Joints: Do not bridge joints with spray foam material. Provide a L-shaped stop/screed on each side of joint, pack joint with compressible insulation, and bridge the joint with flexible transition membrane to provide continuous air barrier assembly.

G. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Field inspections and tests will be performed by a third party ABAA testing agency.

C. Inspection will include verification of insulation thickness and density.

D. Coordination of ABAA Tests and Inspections:

1. Arrange and pay for testing and inspection required by ABAA QAP.
    a. Testing and inspection shall verify conformance with ABAA Quality Assurance Program, the CAN-ULC-S705.2 Installation Standard, manufacturer's written installation instructions, and other requirements of this section.
    b. Unless indicated otherwise, provide ABAA Quality Assurance Program audits in accordance with current "Frequency & Cost of Audits" posted on ABAA website. Forward written inspection reports to the Architect within 10 working days of the inspection and test being performed. In the case of deficiencies, the ABAA-licensed inspector may verbally advise the licensed installer at time of inspection.

2. Notify ABAA in writing of schedule for air barrier work. Allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

E. In addition to the ABAA site inspector, coordinate and provide access for air barrier manufacturer's technical representative to make field reviews during installation and provide technical reports to Contractor, Owner, and Architect.

F. Patch air barrier work that was removed or damaged due to testing.

G. If testing and inspection reveals any defects, promptly remove and replace defective work at no additional expense to the Owner.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION 072736

SECTION 074213.23
METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.

F. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

G. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

K. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

L. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives.

M. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

O. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, coordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.

1. Require attendance by MCM installer, CI framing installer (if a different entity), and other relevant sub-contractors (such as aluminum storefront/curtain wall, air barrier, insulation).
2. Include MCM sheet manufacturer’s representative and wall system manufacturer’s representative to review procedures.
3. Review in detail the schedule, personnel, and installation of adjacent materials and substrate.
4. Review project specific details including joint details (both panel-to-panel joints and panel to adjacent construction), penetrations, openings.
5. Review field testing, inspection, and other quality assurance requirements.

6. Review procedures for protection of work and other construction.

1.03 SUBMITTALS

A. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
   1. Finish manufacturer's data sheet showing physical and performance characteristics.
   2. Storage and handling requirements and recommendations.
   3. Fabrication instructions and recommendations.
   4. Specimen warranty for finish, as specified herein.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.
   4. Specimen warranty for wall system, as specified herein.

C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, support clips, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Indicate panel numbering system.
   2. Differentiate between shop and field fabrication.
   3. Indicate substrates and adjacent work with which the wall system must be coordinated.
   4. Include large-scale details of anchorages and connecting elements.
   5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
   6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

D. Selection Samples: Submit manufacturer's color charts representing manufacturer's standard range of available colors.

E. Verification Samples: For each finish product specified, submit physical sample in manufacturer's standard size indicating selected colors.

F. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.

G. Test Report: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly utilizing identical products and components to those submitted for installation on this project.

H. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.

I. Installer's qualification statement.

J. Testing agency's qualification statement.

K. Maintenance Data: Care of finishes and warranty requirements.

1.04 QUALITY ASSURANCE

A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.

B. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Installer Qualifications: Company specializing in performing work of type specified in this section.
   1. Approved / certified in writing by wall panel system manufacturer.

D. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect finishes by applying heavy-duty removable plastic film during production.
   2. Package for protection against transportation damage.
   3. Provide markings to identify components consistently with drawings.
   4. Exercise care in unloading, storing, and installing panels to prevent bending, warping, twisting, and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in well-ventilated space out of direct sunlight.
   2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
   3. Store at a slope to ensure positive drainage of accumulated water.
   4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
   5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

1.06 FIELD CONDITIONS

A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of wall panels. Complete forms in Owner's name and register with warrantor.

C. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Composite Material (MCM) Sheet Manufacturers:
   1. ALUCOBOND by 3A Composites USA; Alucobond Plus.
   2. Alcoa, Inc.; Reynobond FR.
   3. Alfrex, LLC; Alfrex FR.
   4. ALPOLIC Materials; ALPOLIC/fr (Fire Retardant core).
   5. Fairview Architectural LLC; Vitrabond FR (Non-Combustible).

2.02 WALL PANEL SYSTEM

A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage, or failure.
   1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
   2. Provide panel jointing using a drained and back-ventilated (D/BV) rainscreen type system with an open reveal joint and a separate MCM strip or spline at the rear of the reveal. "Wet seal" exposed sealant joints are unacceptable except for perimeter joints and exposed horizontal joints.
   3. Anchor panels to supporting framing without exposed fasteners.

B. NFPA 285 Fire Propagation Test: Exterior metal-faced composite material wall panel assemblies shall be tested and pass NFPA 285; assembly shall have been tested using identical products and components to those submitted for installation on this project.

2.03 PERFORMANCE REQUIREMENTS

A. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.

B. Fire Performance: Provide panels that have been tested in approved assemblies, in accordance with, and complying with acceptance criteria of NFPA 285.

2.04 PANELS

A. Panels: 1 inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
   1. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
   2. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
   3. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
   4. Fabricate panels under controlled shop conditions.
   5. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
   6. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
      a. Make panel lines, breaks, curves, and angles sharp and true.
      b. Keep plane surfaces free from warp or buckle.
      c. Keep panel surfaces free of scratches or marks caused during fabrication.
   7. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.
   8. Provide means of concealed drainage for panel condensation and water that might accumulate in members of system; drill perforated weep holes on underside return of each panel, and provide insect baffle at each weep hole.

2.05 MATERIALS

A. Metal Composite Material (MCM) Sheet: Fire-retardant composite panel fabricated of two sheets of aluminum sandwiching a mineral-filled core; no foamed insulation material content.
   1. Overall Sheet Thickness: 0.157 inch, minimum (4 mm).
   2. Face Sheet Thickness: 0.020 inches (0.5 mm), minimum, equal thickness for both exterior and interior facings. Unequal facings are not acceptable.
   3. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
   4. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
   5. Flammability: Self-ignition temperature of 650 degrees F or greater when tested in accordance with ASTM D1929.

B. Metal Framing Members: Coordinate with Section 054003.13 - Continuous Insulation (CI) Framing System - Bracket. Provide manufacturer's recommended sub-girts/furring channels, installation clips, base and sill angles and channels, as required for complete installation over continuous insulation framing system.
   1. Provide material strength, dimensions, configuration as required to meet applied loads and in compliance with applicable building code.
   2. Aluminum Components: ASTM B209/B209M; or ASTM B221 (ASTM B221M).

2.06 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, with at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch.

B. Color/Texture: To be selected by Architect from manufacturer's full range.

2.07 ACCESSORIES

A. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet.

B. CI Framing System: Refer to Division 5 Section 054003.13 - Continuous Insulation (CI) Framing System - Bracket.

C. Anchors, Clips, and Accessories: Use one of the following:
   1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666/A666M.
   2. Steel complying with ASTM A36/A36M and hot-dip zinc coating to ASTM A153/A153M.
   3. Steel complying with ASTM A36/A36M and hot-dip galvanized to ASTM A123/A123M, with Coating Thickness Grade of 100.

D. Fasteners:
   1. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
   2. Bolts: Stainless steel.
   3. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.

E. Joint Sealer: Provide color to match wall panels silicone sealant of type approved by MCM sheet manufacturer, and in compliance with ASTM C920.

F. Provide panel system manufacturer's and installer's standard corrosion resistant accessories, including fasteners, clips, anchorage devices, and attachments.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine dimensions, tolerances, and interfaces with other work.
   1. Verify that air barrier system/insulation and CI framing system are properly installed.

B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION

A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.

B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.

C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.

D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

G. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

H. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
   1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
   2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
   3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
   4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.

I. Replace damaged products.

1. Exception: Field repairs of minor damage to finishes are permitted only when approved in writing by Architect, panel manufacturer, and fabricator.
2. Field Repairs to Finishes: Using materials and methods sufficient that repairs are not discernible when viewed at distance of 10 feet under all typical light conditions experienced at the project.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.

3.05 CLEANING

A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.

B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

C. Remove temporary coverings and protection of adjacent work areas.

D. Clean installed products in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION 074213.23

SECTION 075423
TPO MEMBRANE ROOFING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.

D. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

F. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

I. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.

J. FM (AG) - FM Approval Guide.

K. FM DS 1-28 - Wind Design.

L. NRCA (RM) - The NRCA Roofing Manual.

M. NRCA (WM) - The NRCA Waterproofing Manual.

N. UL (FRD) - Fire Resistance Directory.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at the Project site one week before starting work of this section.

1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.03 SUBMITTALS

A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

B. Shop Drawings: Submit drawings that indicate joint or termination detail conditions and conditions of interface with other materials.

1. Include details of tapered insulation and crickets
2. Include edge conditions showing details of roofing assembly connection to wall air barrier material to maintain a continuous air barrier system.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1. Submit in the form of manufacturer's assembly letter, indicating each component of the roofing assembly as specified, and that assembly meets performance requirements and manufacturer's warranty conditions.

D. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Warranty Documentation:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of products specified, with UL-listed roof assemblies for roof systems indicated.

B. Installer Qualifications: Company specializing in installation of roof systems indicated, and approved / certified by roofing manufacturer to install products specified.

C. Insulation Manufacturer Qualifications: Approved by roof membrane manufacturer, and approved and labeled under third party quality program as required by applicable building code.
   1. Insulation Labeling: All foam insulation shall bear the label of testing/inspection agency, and shall include manufacturer identification, product identification, performance characteristics, and other information as necessary to verify code compliance for intended end use.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.06 FIELD CONDITIONS

A. Do not install roofing materials during unsuitable weather, or when unsuitable weather is expected. Proceed only when field conditions are in accordance with roofing manufacturer's installation and warranty requirements.

B. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

C. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Special Warranty - Manufacturer: Manufacturer's warranty form, customized for project-specific conditions.
   1. Manufacturer's warranty shall be a "total system" or "edge-to-edge" warranty; no dollar limit ("NDL").

2. Include all components of roofing system including, but not limited to, roofing membrane, roof insulation, adhesives and fasteners, flashings, edge metals and copings, substrate board, vapor retarder/air barrier, roof insulation, and cover board.
3. Manufacturer's Total System Warranty Period: 20 years, from date of Substantial Completion.

C. Special Warranty - Installer: Installer shall sign and submit per warranty form attached at end of this section.
1. Installer's warranty shall cover all components of roofing system, matching manufacturer's warranty above.
2. Installer's Warranty Period: 2 years, from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
1. Carlisle Roofing Systems, Inc.
2. Elevate.
3. GAF.
4. Johns Manville.

2.02 ROOFING

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over cover board, insulation, vapor retarder/air barrier, substrate board, and metal roof decking.

B. Roofing Assembly Performance Requirements:
1. General: Installed roofing assembly and all associated components shall remain secure and watertight and shall withstand weather exposure, wind uplift pressures specified, and thermal movements. Roofing manufacturer shall certify that all roofing assembly components are compatible with each other and with adjacent materials for applications indicated.
2. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
3. Assembly Resistance to Internal Fire: Manufacturer's assembly shall be tested to and satisfactorily pass NFPA 276 or UL 1256.
4. Wind / Uplift Design: Membrane roofing system shall be identical to system that has been successfully tested by a qualified testing and inspecting agency to resist uplift pressures calculated according to ASCE 7 as established by applicable building code and loading indicated.
a. Corner, Perimeter, Field-of-Roof Uplift Pressures: Per applicable building code and values indicated on Structural Drawings.
b. Static Uplift: In addition to uplift requirements above, system shall be tested for static uplift per FM 4474, UL 580, or UL 1897.
5. Assembly Thermal Resistance (R-Value): Provide roof assembly with a minimum assembly R-value of R-30 in accordance with applicable IECC requirement for commercial roofing.
6. Accelerated Weathering: 2,000 hours minimum exposure, when tested in accordance with ASTM G152, ASTM G154, or ASTM G155.
7. Ponding Water: Ponding water shall not remain on the roof 24 hours after a rainfall event.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

A. Membrane Roofing Materials:

1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
    a. Thickness: 60 mil, 0.060 inch, minimum.
2. Sheet Width: Factory fabricated into widest possible sheets.
3. Color: White.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Flexible Flashing Material: Same material as membrane.

2.04 DECK SUBSTRATE BOARD

A. Deck Substrate Board: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
1. Thickness: 1/2 inch, fire-resistant.
2. Products:
    a. CertainTeed Corporation; GlasRoc Sheathing.
    b. Georgia-Pacific; DensDeck Prime.
    c. National Gypsum Company; DEXcell Glass Mat Roof Board.
    d. USG Corporation; Securock Ultralight Glass-Mat Roof Board.

2.05 VAPOR RETARDER / AIR BARRIER

A. Vapor Retarder / Air Barrier Sheet, Self-Adhered: Composite sheet fabricated of rubberized asphalt factory laminated to polyethylene/polypropylene film with release liner. Product shall be approved by primary roofing manufacturer, and comply with the following:
1. Total Thickness: 30 mils, minimum.
2. Air Permeance: Less than 0.004 cfm/sq.ft. when tested per ASTM E2178.
3. Vapor Permeance: Less than 0.1 perm when tested per ASTM E96/E96M.
4. Products:
    a. Carlisle; VapAir Seal 725 TR.
    b. Elevate; V-Force Vapor Barrier.
    c. GAF; SA Vapor Retarder XL.
    d. Johns Manville; JM Vapor Barrier SA.

2.06 COVER BOARDS

A. Cover Board: High compressive strength polyisocyanurate (ISO) board insulation complying with ASTM C1289, and the following characteristics:
1. Classifications:
    a. Type II - Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
        1) Class 4 - Faced with coated or uncoated glass fiber mat facers on both major surfaces of the core foam. This product is used at a maximum thickness of 1/2 inch (12.7 mm).
            (a) Compressive Strength: 80 psi, minimum.
2. Board Size: 48 by 48 inches, maximum.
3. Board Thickness: 1/2 inch.
4. Thermal Resistance: R-value of 2.5, minimum, at 1/2 inch thick and 75 degrees F mean temperature.
5. Products:
    a. Carlisle; SecurShield HD.

b. Elevate; Isogard HD Cover Board.
c. GAF; EnergyGuard HD.
d. Johns Manville; ProtectoR.

2.07 INSULATION

A. Surface Burning Characteristics: Foam plastic insulation shall have a maximum flame spread index of 75, and maximum smoke developed index of 450, when tested in accordance withASTM E84 at maximum thickness intended for use.

B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II:
         1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
         2) Compressive Strength: Grade 2 - 20 psi, minimum.
   2. Tapered Board: Slope as indicated, but no lower than 1/4 inch per foot; minimum thickness 1/2 inch; fabricate of fewest layers possible.
   3. Preformed Shapes: Provide saddles crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, but no less than 1/4 inch per 12 inches, and no less than 1/8 inch per 12 inches in valleys.

2.08 ACCESSORIES

A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

B. Sheathing Joint Tape: Paper type, self adhering.

C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

D. Membrane Adhesive: As recommended by membrane manufacturer.

E. Insulation Adhesive: As recommended by insulation manufacturer.

F. Sealants: As recommended by membrane manufacturer.

G. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Roofing membrane manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and other accessories are in place.

3.02 PREPARATION - METAL DECK

A. Install deck sheathing on metal deck:
   1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
   2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
   3. Tape joints.
   4. Mechanically fasten substrate board to roof deck, in accordance with Factory Mutual recommendations and roofing manufacturer's instructions.
      a. At locations where metal roof deck will be exposed from below in the finished work, carefully coordinate fastener attachment such that fasteners do not penetrate the bottom flanges of the metal deck. Remove fasteners that penetrate the bottom flanges and replace with properly located fasteners, and restore metal deck to Owner's satisfaction.

3.03 INSTALLATION, GENERAL

A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.

B. Do not apply roofing membrane during cold or wet weather conditions.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.04 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE

A. Install vapor retarder over substrate surface in accordance with manufacturer's instructions.
   1. Extend vapor retarder under blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Attachment of Insulation:
   1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions.
      a. At locations where metal roof deck will be exposed from below in the finished work, carefully coordinate fastener attachment such that fasteners do not penetrate the bottom flanges of the metal deck. Remove fasteners that penetrate the bottom flanges and replace with properly located fasteners, and restore metal deck to Owner's satisfaction.
   2. Embed subsequent layer(s) of insulation into either ribbons or full bed of adhesive as required to comply with performance or warranty requirements, and in accordance with roofing and insulation manufacturers' instructions.
   3. Install a minimum of two layers of insulation, with a minimum total thickness of 5 inches, to achieve a cumulative Long Term Thermal Resistance (LTTR) value of 28.5 per ASTM C 1289, followed by a cover board.

D. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.

E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

F. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

G. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

H. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.

I. Do not install more insulation than can be covered with membrane in same day.

J. Cover Boards: Secure cover boards in accordance with roofing manufacturer's instructions with manufacturer's insulation adhesive. Install cover boards with joints staggered minimum 6 inches from joints of preceding insulation layer.

3.05 INSTALLATION - MEMBRANE

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive to substrate per manufacturer's instruction. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Overlap edges and ends and seal seams by heat welding, minimum 3 inches. Seal permanently waterproof.

E. At intersections with vertical surfaces other than parapets:
   1. Extend membrane over cant strips and up a minimum of 8 inches onto vertical surfaces and secure with a termination bar.
   2. Coordinate with Division 7 for counterflashing.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Install roofing expansion joints where indicated. Make joints watertight.

H. Coordinate installation of roof drains and sumps and related flashings.

I. Install walkway pads in layout indicated. If not indicated, provide from roof access hatch/door to each major piece of rooftop equipment and fully around perimeter of equipment. Space pad joints to permit drainage.

3.06 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide on-site inspection by roofing manufacturer's technical representative at least three times (deck/substrate examination, in-progress, and warranty inspection) during installation of this work.

C. Repair or replace roofing components where inspection determines they are defective.
   1. Repair or replace roofing system where ponding occurs in excess of specified requirement.

3.07 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

D. Provide a final cleaning of the roof membrane immediately prior to Substantial Completion to remove dirt, clay and other soiling.

3.08 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

ROOFING INSTALLER'S WARRANTY

WHEREAS _____

of (Address) _____

herein called "Contractor," has provided roofing and associated "work" for the following project:

Owner: _____

Address: _____

Area of Work: _____ Date of Acceptance: _____

Warranty Period: _____ Date of Expiration: _____

Roofing Contractor: _____

Address: _____

1.

AND WHEREAS Contractor has contracted directly with the Owner to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period.

NOW THEREFORE the (General) Contractor shall maintain the entire roof system in a completely watertight condition at no cost to the Owner for two (2) years from date of final acceptance; except this watertight guarantee shall not be enforced when the Contractor can prove water damage was caused by the Owner.

This guarantee covers the roofing membrane and flashing, metal flashing, parapet copings and edge metals, and properly detailed penetrations of the roofing membrane for such things as stacks, curbs, and expansion joints which exist when the work is performed

The Roofing Contractor shall guarantee its materials and workmanship associated with the roofing, flashings, and sheet metal work incidental to the work required under the roofing subcontract, against defect due to faulty materials or workmanship for a period of two (2) years from the date of completion of such work. It is understood and agreed by all parties hereto that the responsibility of the roofing contractor under this guarantee form or any contract document shall be limited to the limited guarantee herein expressed by said roofing contractor.

The undersigned named Owner agrees, from the date of acceptance of the project, to maintain the roof in accordance with the manufacturer’s written requirements and agrees to avoid damage to the roof surface by any parties under his control working or walking on the roof. The Owner recognizes his responsibility to inspect the roof semi-annually.

IN WITNESS THEREOF, this instrument has been duly executed this

_____ day of _____, 20_____ .

_____

General Contractor (Firm)

By:

_____

Name

_____

Authorized Signature

_____

Roofing Contractor (Firm)

By:

_____

Name

_____

Authorized Signature

_____

Owner

By:

_____

Name

_____

Authorized Signature

END OF SECTION 075423

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

E. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement.

H. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used including technical material properties.
   1. Include installation instructions and manufacturer's recommendations for installation and maintenance.
   2. Include ANSI/SPRI/FM 4435/ES-1 wind pull-off performance data for systems that will be used in edge metal conditions.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Selection Samples: Provide manufacturer's color charts for each product and material requiring color selection.

D. Verification Samples: Submit physical samples, manufacturer's standard size, for each selected color.

1.03 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work, with experience in projects of size and scope similar to this Project.

1.04 MOCK-UP

A. See Section 014000 - Quality Requirements for additional requirements.

B. Integrated Exterior Mockup: Attend preinstallation conference and provide metal flashing/trim work for integrated exterior mockup as indicated on Drawings and as specified in Division 1 Section "Quality Requirements."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gauge (0.028-inch) thick base metal, shop pre-coated with PVDF coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: To be selected by Architect from Manufacturer's full range.

B. Pre-Finished Aluminum: ASTM B209/B209M; 18 gauge, 0.040 inch thick; plain finish shop pre-coated with PVDF coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; pretreated metal with two-coat system including primer and color coat with at least 70 percent PVDF coating.
   2. Color: To be selected by Architect from Manufacturer's full range.

C. Stainless Steel: ASTM A666/A666M, Type 304 alloy, soft temper, 24 gauge (0.025-inch) thick; smooth No. 2D finish.

D. Copper: ASTM B370, cold rolled 16 oz/sq ft, 24 gauge, 0.0216 inch thick; natural finish.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Tin edges of copper sheet to be soldered; solder shop formed metal joints, and after soldering, remove flux, wipe and wash solder joints clean; provide weathertight joints.

F. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.
   1. Hem exterior corners of flashings and drip edges, in a manner that eliminates sharp, exposed cut metal edges, at locations below 6'-0" above grade (locations within reach range of building occupants).

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.03 GUTTERS AND DOWNSPOUTS

A. General: Provide minimum 0.040-inch aluminum extrusions for gutters and minimum 0.032-inch aluminum for downspouts. Finish all parts of gutter/downspout system a single color to match, including brackets, elbows and bends, and exposed fastener heads.

B. Gutters: SMACNA Ogee profile (Style K); unless otherwise indicated.

C. Downspouts: Rectangular profile; unless otherwise indicated.

D. Gutter and Downspout Sizing: Unless otherwise indicated, provide 4-inch deep by 5-inch wide downspouts, with gutter depth to accept 4-inch deep downspout.

E. Accessories: Profiled to suit gutters and downspouts. Provide additional elbows, bends, extended bracket depths, and other accessories as required for downspouts to avoid conflict with cladding profiles, masonry or precast extrusions, and other surface ornamentation on wall.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Straps and spacer bars (SMACNA figure 1-17), spaced no more than 24 inches on center.
   3. Downspout Supports: Brackets; spaced no more than 60 inches on center.
   4. Downspout Strainers: Provide ball-type mesh strainer at each downspout; pre-fabricated, non-corrosive construction compatible with gutter/downspout material.

F. Splash Blocks: Precast concrete type, of size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment. Lightweight "patio" blocks are not acceptable.
   1. Provide a splash block at all conditions where downspout is not indicated to connect to downspout boot, and at conditions where downspout empties onto lower roof.

G. Downspout Boots: Cast iron, inlet sized to match downspout; outlet sized for underground drainage piping. Coordinate with Plumbing Drawings and Division 22.

H. Seal metal joints.

2.04 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer Type: Zinc chromate.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

F. Reglets and Counterflashings (Masonry): Embedded type, copper. Coordinate with Division 4 Section "Unit Masonry."
   1. Existing Brick: Saw cut joint in brick joints to uniform 3/4-inch depth. Insert preformed metal receiver/reglet piece to full depth of saw cut and secure it with lead wedges at 12-inches o.c. Place continuous backer rod and elastomeric sealant in cut joint reglet. Insert the separate counterflashing piece into reglet so that bottom of flashing makes permanent spring clamping contact with base flashing.

G. Reglets and Counterflashings (Non-Masonry): Surface mounted two-piece reglet and counterflashing, or one-piece counterflashing, fabricated of pre-finished aluminum or galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets and one-piece counterflashings true to lines and levels, and seal tops with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Comply with SMACNA installation instructions and drawing details.

B. For reglets installed into masonry veneer, furnish reglets to mason for installation as Division 4 Unit Masonry work progresses.

C. Insert flashings into reglets to form tight fit; secure in place with wedges; seal flashings into reglets with sealant.

D. Secure flashings in place using concealed fasteners.

E. Apply plastic cement compound between metal flashings and felt flashings.

F. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

G. Seal metal joints watertight.

H. Secure gutters and downspouts in place with concealed fasteners.

I. Slope gutters 1/4 inch per 10 feet, minimum.

J. Connect downspouts to downspout boots, and grout connection watertight.

K. At low roof conditions, and where not indicated to connect to downspout boots, provide a bottom elbow and set splash blocks under downspouts.

END OF SECTION 076200

SECTION 077100
ROOF SPECIALTIES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems.

C. NRCA (RM) - The NRCA Roofing Manual.

1.02 SUBMITTALS

A. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
   1. Include test data/confirmation that copings and edge metals conform to ANSI/SPRI/FM 4435/ES-1 performance requirements.

B. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

C. Samples for Selection: Provide manufacturer's color charts for each product and material requiring color selection.

D. Samples for Verification: Submit physical samples, manufacturer's standard size, for each selected color.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Metals and Copings: Provide private-labeled products by one of the roofing manufacturers listed in Division 7 roofing section(s) as required to meet requirements and comply with terms of manufacturer's total system warranty. Edge metals and copings shall be factory pre-fabricated; field-fabricated brake-metal assemblies are not acceptable.

2.02 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
   1. Configuration: Fascia, and edge securement for roof membrane.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.

B. Gravel Stop: Factory fabricated to sizes required; corners mitered; concealed fasteners.
   1. Configuration: Concealed continuous hold down cleat; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-2 to positive and negative design wind pressure as defined by applicable local building code.
   3. Wall Width: As indicated on drawings.
   4. Outside Face Height: 6 inches.

5. Material: Formed aluminum sheet, 0.040 inch thick, minimum, for wall thickness up to 15 inches. Provide minimum 0.063 inch thick where total wall thickness is over 15 inches.
6. Finish: AAMA 2605, 70 percent polyvinylidene fluoride (PVDF).
7. Color: To be selected by Architect from Manufacturer's full range.
8. Products: Provide roofing manufacturer's private labeled product to maintain terms of manufacturer's total system warranty; provide one of the following or comparable:
    a. Carlisle; SecurEdge 200 Gravel Stop.
    b. Elevate; Elevate Gravel Stop.
    c. GAF; EverGuard Gravel Stop.
    d. Johns Manville; Johns Manville Gravel Stop.

C. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
    a. Provide cantilever design sized for installation over masonry veneer without attachment to veneer.
    b. Size copings to allow for cavity ventilation; do not block top of cavity with continuous nailers, and do not seal between coping and front veneer.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Wall Width: As indicated on drawings.
4. Outside Face Height: 6 inches.
5. Inside Face Height: 4 inches.
6. Material: Formed aluminum sheet, 0.050 inch thick, minimum, for wall thickness up to 15 inches. Provide minimum 0.063 inch thick where total wall thickness is over 15 inches..
7. Finish: AAMA 2605, 70 percent polyvinylidene fluoride (PVDF).
8. Color: To be selected by Architect from Manufacturer's full range.
9. Products: Provide roofing manufacturer's private labeled product to maintain terms of manufacturer's total system warranty; provide one of the following or comparable:
    a. Carlisle; SecurEdge 200 Gold Cantilever Coping.
    b. Elevate; Elevate Gold Cantilever Coping.
    c. GAF; EverGuard Gold Cantilever Coping.
    d. Johns Manville; Perma-Tite Gold Cantilever Coping.

D. Roof Penetration Sealing Systems: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

E. Multiple Penetration/Pipe Housing: Where multiple penetrations are required in close proximity, provide pipe chase housing fabricated of structural aluminum or galvanized steel curb, pre-finished aluminum chase housing with removable top cover, and individual gasketed pipe seals which exit the side walls of the housing. Size housing and provide number and size of pipe seals as required for each application.
1. Manufacturers:
    a. Alta Products, LLC; Sigrist Pipe Chase Housing.
    b. Roof Penetration Housings, LLC; the Vault.

2.03 ELASTIC ROOF EXPANSION JOINTS

A. Elastic Expansion Joints (Bellows-Type): Pre-fabricated joint assembly, consisting of a elastomeric flashing forming the primary joint membrane in a “bellows” shape, with 16 oz. copper flanges on each side; custom size and profile to suit project conditions indicated. Provide with manufacturer’s standard polymeric moisture barrier and insulation on underside of expansion joint as indicated. Provide complete assembly with splicing and accessory materials as required.
   1. Elastic-type expansion joint shall be approved by roofing manufacturer for compliance with roofing products and to maintain conditions of manufacturer’s warranty.
   2. Curb Flange Type: Metal L-shaped flange on each side of bellows, formed to curb size indicated.
   3. Wall-to-Curb Type: Metal flanged edges; 4-inch flat flange at vertical wall condition and L-shaped flange at curb side of bellows, formed to curb size indicated.

2.04 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors.

2.05 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
   1. Provide stainless steel fasteners for all exterior construction and for fastening aluminum and stainless steel fabrications.

C. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Install components weathertight; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

C. Seal joints within components when required by component manufacturer.

D. Anchor components securely.

E. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

F. Coping Installation: Install coping cleats and chair with concealed fasteners. Anchor as required to meet ANSI/SPRI performance requirements and manufacturer's instructions, but at spacing of no greater than 36 inches on center.

G. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION 077100

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

B. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

1.02 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. General: Coordinate with Division 22, 23, and 26 for roof curbs and equipment supports specified with specific pieces of equipment.

B. Roof Curbs Manufacturers:
   1. AES Industries Inc.
   2. Curbs Plus, Inc.
   3. The Pate Company.
   4. LMCurbs.
   5. Roof Products & Systems (RPS).
   6. Thybar Corporation.
   7. Substitutions: See Section 016000 - Product Requirements.

C. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of corrugated metal roof deck with insulation.
   2. Sheet Metal Material: Galvanized (zinc-coated) or galvalume (aluminum-zinc alloy) steel sheet; minimum 18 gauge (0.052-inch) thick; mill finish.
   3. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
      a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch clearance between curb and metal roof panel flange allowing water to properly flow past curb.
      b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.

c. Maintain at least 12 inch clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.

4. Provide layouts and configurations indicated on drawings.

D. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
1. Provide preservative treated wood nailers along top of rails.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

B. Roof Curbs and Equipment Supports: Install in lengths and in a manner such that curbs and equipment supports span multiple structural framing members, with adequate blocking and supports to distribute the equipment loads over metal decking and structural members without crushing.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 077200

SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

C. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

D. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

E. FM (AG) - FM Approval Guide.

F. ITS (DIR) - Directory of Listed Products.

G. SCAQMD 1113 - Architectural Coatings.

H. UL (FRD) - Fire Resistance Directory.

I. UL 1479 - Standard for Fire Tests of Penetration Firestops.

1.02 SUBMITTALS

A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

C. Installer's qualification statement.

1.03 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Labeling: Provide permanent labels adjacent to each firestopping assembly. Labels shall be durable metal or plastic and fastened mechanically or with a self-adhering backing. Labels shall include the tested assembly/system number, fire rating of the adjacent building element/ firestopping, the firestopping installer and certification, date of installation, and specific instructions to "Do Not Disturb" and "Alert Building Personnel of Damage."

1. Coordinate with Division 09 "Painting" for stenciled painted labeling of fire-rated walls and partitions.

C. Installer Qualifications: Company specializing in performing the work of this section and trained/certified by firestopping manufacturer.

1.04 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products.
   2. A/D Fire Protection Systems Inc.
   3. Hilti, Inc.
   4. RectorSeal, a CSW Industrials Company.
   5. Specified Technologies Inc.
   6. Tremco Commercial Sealants & Waterproofing.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero (0) in accordance with ASTM G21.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

C. Low-Emitting Materials:
   1. Paints and Coatings: Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.
   2. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Air Leakage (Smoke Barriers): Provide systems that have been tested to show L Rating of no more than 5.0 cfm/sq. ft., both at ambient and elevated 400 deg F temperatures.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of

penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

1. Coordinate with Division 09 Painting contractor to ensure that all fire-rated walls and partitions are properly labeled.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 078400

SECTION 078426
THERMAL BARRIERS FOR PLASTICS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

C. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.

D. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.

E. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

F. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems.

G. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

I. AWCI Technical Manual 12-B - Standard Practice for the Testing and Inspection of Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide.

J. FM (AG) - FM Approval Guide.

K. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials.

L. ITS (DIR) - Directory of Listed Products.

M. NFPA 275 - Standard Method of Fire Tests for the Evaluation of Thermal Barriers.

N. UL (FRD) - Fire Resistance Directory.

O. UL 1040 - Standard for Safety Fire Test of Insulated Wall Construction.

P. UL 1479 - Standard for Fire Tests of Penetration Firestops.

Q. UL 1715 - Standard for Safety Fire Test of Interior Finish Material.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting at the Project site one week before starting work of this section. Include other relevant installers including installers of any foam plastic materials over which thermal barriers are to be installed.

1.03 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance ratings, and limitations.

B. Product Test Reports: Provide test data indicating compliance with both Temperature Transmission Test and Integrity Fire Test.

C. Evaluation/Compatibility Reports: Provide data indicating tested compatibility with submitted foam plastic material, for each assembly required.

D. Installer's qualification statement.

E. Inspection Reports: Provide inspection reports certified by thermal barrier manufacturer's technical representative, indicating that thermal barrier has been installed in accordance with manufacturer's requirements.

1.04 QUALITY ASSURANCE

A. Fire Testing: Provide assemblies that provide 15-minute thermal barrier protection when tested in accordance with both the Temperature Transmission Fire Test and the Integrity Fire Test required by NFPA 275.
   1. Temperature Transmission Test: The thermal barrier product shall be tested for standard fire exposure in accordance with ASTM E119 or ANSI/UL 263.
   2. Integrity Fire Test: The thermal barrier assembly, including the specific thermal barrier and foam plastic products submitted for this project, shall be tested as an assembly in accordance with NFPA 276, FM 4880, ANSI/UL 1040, or ANSI/UL 1715.
   3. Evidence of passing both test requirements shall be required.
      a. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
      b. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
      c. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Surface-Burning Characteristics: Thermal barrier product shall be tested in accordance withASTM E84 and shall be rated for plenum exposure with maximum flame-spread index of 25 and maximum smoke-developed index of 50.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained, certified, or licensed in writing by manufacturer.

D. Manufacturer's Inspection: Manufacturer's technical representative shall inspect foam plastic substrates prior to installation and in-progress work to ensure compliance with manufacturer's requirements, and shall provide inspection reports after each visit.
   1. Thermal barrier installer shall coordinate with manufacturer to provide anticipated installation dates.

1.05 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermal Barrier Manufacturers and Products:
   1. Fire-Resistive, Water-Based, Intumescent Mastic Coating for Cellular Foam:
      a. Thermal Product Research (TPR^2); Fireshell F10E.
      b. Flame Seal Products, Inc.; Flame Seal TB.
      c. International Fireproof Technology, Inc.; DC315.
      d. No-Burn, Inc; No-Burn Plus ThB.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealants, and other accessory materials as required by manufacturer, that are compatible with the other materials in the thermal barrier assembly and that maintain the thermal barrier rating of the assembly.

B. Mold and Mildew Resistance: Provide thermal barrier and accessory materials with mold and mildew resistance rating of zero (0) in accordance with ASTM G21.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed thermal barriers until special inspections are complete.

C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

A. Special Inspections: Inspection agency employed and paid by Owner, will examine all spray-applied fireproofing, including thermal barriers, in accordance with the IBC edition applicable to this Project.

1. Testing Services: All fireproofing/thermal barriers shall be tested according to ASTM E605/E605M and ASTM E736/E736M. Mastics shall be tested according to AWCI Technical Manual 12-B.

B. Repair or replace spray-applied fireproofing and thermal barriers at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of thermal barrier overspray; clean all adjacent surfaces after application.

3.06 PROTECTION & REPAIR

A. Protect adjacent surfaces from damage by material installation.

B. If installed thermal barrier must be cut due to subsequent penetrations or other work, provide additional patching work as required to restore thermal barrier to a continuous, complete assembly at the time of Substantial Completion.

C. Repair damage to thermal barriers caused by construction activities; verify that repaired work maintains a continuous, complete thermal barrier assembly.

END OF SECTION 078426

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

C. ASTM C834 - Standard Specification for Latex Sealants.

D. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

E. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

G. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants.

I. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.

J. ASTM C1311 - Standard Specification for Solvent Release Sealants.

K. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

L. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

M. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

N. SCAQMD 1113 - Architectural Coatings.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

D. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

E. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

F. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

G. Executed warranty.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section, and is approved and/or certified by manufacturer.

B. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver sufficient samples to manufacturer for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

C. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
   1. Identification of testing agency.
   2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
      a. Test date.
      b. Copy of test method documents.
      c. Age of sealant upon date of testing.
      d. Test results, modeled after the sample form in the test method document.
      e. Indicate use of photographic record of test.

D. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.
   3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
   6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

E. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches long.
   2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.

3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Wall and ceiling joints.
      c. Joints between plumbing fixtures and floor or wall construction.
      d. Other joints indicated below.
   3. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with expansion joint cover assemblies.
      c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
      d. Joints where sealant installation is specified in other sections.

B. Exterior Joints: Use non-sag non-staining silicone sealant (ES-1), unless otherwise indicated.
   1. Type ES-5 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
   2. Type ES-1 or ES-2 - Joints between walls and frames of doors, windows, and louvers.
   3. Type SRS-1 - Bedding joints.

C. Interior Joints: Use non-sag polyurethane sealant (ES-4), unless otherwise indicated.
   1. Type ES-3 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
   2. Type ES-5 - Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.
   3. Type AS-1 - Joints at sound-rated or acoustic assemblies, and at full-height panel wall and partition assemblies indicated to have sound attenuation batts.
   4. Type LS-1 - Joints around perimeters of interior doors, windows, elevator entrances, and similar framed openings.

D. Interior Wet Areas: Bathrooms, restrooms, and kitchens; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

F. Areas Where Tamper- or Pick-Resistance is Required: Within the secure area designated on the Drawings, and as follows:

1. Security Sealants shall be used at all construction joints in secure areas designated for detainee holding and transport areas. Joints above ceilings, covered by expansion joints, or otherwise concealed are excluded.
2. Provide "tamper-resistant" security sealants for supervised areas (processing/booking, corridors, hearing rooms, etc.) and "pick-resistant" security sealants for areas not subject to continuous supervision (holding cells). Do not use pick-resistant epoxy in building joints such as control or expansion joints; use tamper-resistant polyurethane at these locations.
    a. Provide tamper resistant polyurethane for all exposed voids between finish materials, and between finish materials and surface mounted devices that inmates could use to hide contraband in inmate-accessible rooms inside the secure perimeter. Provide also at flooring terminations to walls where no base is scheduled (or painted base only), and at joints between ceilings and walls.
    b. In holding cells, provide pick-resistant epoxy at all perimeter joints of all permanent materials and objects (i.e. security ceilings, floors, concrete bed, security hollow metal frames, air grilles, wall embed plates), and provide tamper-resistant polyurethane at all perimeter joints of removable objects (i.e. surface mounted toilet fixtures, emergency intercom, security speaker, exposed wiring devices such as cover plates and receptacles).
3. Refer to Detention and Security Control Systems/Access Control specifications (Divisions 11 and 28) for additional references and requirements for security sealants.

2.02 JOINT SEALANTS - GENERAL

A. Low-Emitting Materials:

1. Paints and Coatings: Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.
2. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

2.03 NONSAG JOINT SEALANTS

A. Type ES-1 - Low-Modulus Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 50 percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Color: To be selected by Architect from manufacturer's full range.
5. Products:
    a. Momentive Performance Materials, Inc/GE Silicones; SCS 2000 SilPruf.
    b. Pecora Corporation; Pecora 890 NST (Non-Staining Technology) or 890 FST (Field Tint).
    c. Polymeric Systems, Inc.; PSI-641.

d. Sika Corporation; Sikaflex HY 100.
e. Tremco Commercial Sealants & Waterproofing; Spectrem 3 or Spectrem 4-TS (Field Tint).
f. Substitutions: See Section 016000 - Product Requirements.

B. Type ES-2 - Medium-Modulus Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Color: To be selected by Architect from manufacturer's full range.
5. Manufacturers:
a. Dow Chemical Company; DOWSIL 795 Silicone Building Sealant.
b. Momentive Performance Materials, Inc/GE Silicones; SCS9000 SilPruf NB - Non-Staining Silicone Weatherproofing Sealant.
c. Pecora Corporation; Pecora 895 NST (Non-Staining Technology).
d. Tremco Commercial Sealants & Waterproofing; Spectrem 2.
e. Substitutions: See Section 016000 - Product Requirements.

C. Type ES-3 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic. Neutral- or acid-curing per manufacturer standard.
1. Color: White.
2. Products:
a. Dow; DOWSIL 786 Mildew Resistant.
b. Pecora Corporation; Pecora 898 NST (Non-Staining Technology).
c. Sika Corporation; Sikasil N Plus US.
d. Tremco Commercial Sealants & Waterproofing; Tremsil 600 or Tremsil 200.
e. Substitutions: See Section 016000 - Product Requirements.

D. Type ES-4 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Color: To be selected by Architect from manufacturer's full range.
3. Products:
a. ITW Polymers Sealants; Permathane SM 7200.
b. Pecora Corporation; DynaTrol II.
c. Sika Corporation; Sikaflex-2c NS.
d. Tremco Commercial Sealants & Waterproofing; Dymeric 240 FC or Vulkem 227.
e. Substitutions: See Section 016000 - Product Requirements.

E. Security Sealant - "Tamper-Resistant" Polyurethane Sealant: ASTM C920, Grade NS, Uses M, G, and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
2. Hardness Range: 50 to 60, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's full range.
4. Products:

a. Pecora Corporation; DynaFlex SC.
b. Sika Corp; Sikaflex 11FC or Sikaflex CR195.

F. Security Sealant - "Pick-Resistant" Epoxy Sealant: ASTM C881/C881M, Type I and III, Grade 3, Class B and C; two-component.
1. Hardness Range: 65 to 75, Shore D, when tested in accordance with ASTM C661.
2. Color: To be selected by Architect from manufacturer's full range.
3. Products:
a. Euclid Chemical; Dural 452 Gel.
b. Pecora Corporation; DynaPoxy EP-1200 Two-Part Epoxy Security Sealant.
c. Sika Corp; Sikadur 23.
d. Substitutions: See Section 016000 - Product Requirements.

G. Type LS-1 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's full range.
2. Grade: ASTM C834; Grade NF.
3. Products:
a. Bostik, Inc; Chem-Calk 600.
b. ITW Polymers Sealants; SM 8200.
c. Master Builders Solutions; MasterSeal NP 520.
d. Pecora Corporation; AC-20 +Silicone.
e. Tremco Commercial Sealants & Waterproofing; Tremflex 834.
f. Substitutions: See Section 016000 - Product Requirements.

H. Type AS-1 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging acoustical sealant.
1. Color: Standard colors matching finished surfaces, Type OP (opaque).
2. Grade: ASTM C834; Grade NF.
3. Manufacturers:
a. Accumetric LLC; BOSS 826 Acoustical Sound Sealant.
b. Franklin International, Inc; Titebond GREENchoice Acoustical Smoke & Sound Sealant.
c. Hilti, Inc; CP 506 Smoke and Acoustical Sealant.
d. Master Builders Solutions; MasterSeal NP 520.
e. Momentive Performance Materials, Inc/GE Silicones; RCS20 Acoustical.
f. Pecora Corporation; AC-20 FTR or AIS-919.
g. Specified Technologies Inc; Smoke N' Sound Acoustical Sealant.
h. Tremco Commercial Sealants & Waterproofing; Tremstop Smoke and Sound.
i. Substitutions: See Section 016000 - Product Requirements.

I. Type SRS-1 - Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
1. Products:
a. Bostik, Inc; Chem-Calk 300.
b. Pecora Corporation; Pecora BC-158 Butyl Rubber Sealant.
c. Tremco Inc.; Tremco Butyl Sealant.
d. Substitutions: See Section 016000 - Product Requirements.

2.04 SELF-LEVELING JOINT SEALANTS

A. Type ES-5 - Self-Leveling Polyurethane Sealant for Traffic: Polyurethane; ASTM C920, Grade P, Uses T, M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Products:
      a. Bostik, Inc.; Chem-Calk 550.
      b. Pacific Polymers, Inc; Elast-Thane 227 Type 1 (Self-Leveling).
      c. Pecora Corporation; Dynatrol II-SL.
      d. Polymeric Systems, Inc; PSI-270SL.
      e. Tremco Commercial Sealants & Waterproofing; Vulkem 445SSL.
      f. W. R. MEADOWS, Inc; POURTHANE SL.
      g. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
   3. Record each test on Preinstallation Adhesion Test Log as indicated.
   4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

J. Installation of Security Sealants: Install in locations indicated in accordance with manufacturer's written recommendations.

1. Apply pick-resistant non-flexible 95 shore “A” hardness epoxy type security sealant in all spaces and cracks between similar and dissimilar materials including, but not limited to, metal frames, windows, all fixtures except vitreous china plumbing fixtures, detention furniture, embeds, secure air diffusers, lock columns and receivers.
2. Apply tamper resistant flexible 55 shore “A” hardness security sealant in any open joints located in cells, including joints at the intersections of walls to walls, walls to ceilings and walls to floors.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet, notify Architect immediately.

D. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

E. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION 079200

SECTION 079513
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products.

B. UL (DIR) - Online Certifications Directory.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.03 SUBMITTALS

A. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

B. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.

C. Selection Samples: Provide manufacturer's color charts, for exposed finish options for each expansion joint product.

PART 2 PRODUCTS

2.01 EXPANSION JOINT COVER ASSEMBLIES, GENERAL

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.

1. Source Limitations: Provide each type of joint through a single source from a single manufacturer.
2. Joint Dimensions and Configurations: Provide expansion joint covers sized for joint widths indicated on Drawings, unless otherwise indicated.
3. Joint Movement Capability: If not indicated, provide minimum 50 percent (+25/-25) joint movement capability .
4. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
5. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
6. Finish: Color for all joints shall be selected from manufacturer's full range of available colors.
    a. Where length of expansion joint spans multiple finishes (for example, exterior wall assembly with face brick 1, precast sill/water table, and face brick 2), provide different finish joint color at each building finish material.

B. Exterior Joints at Cavity/Masonry Veneer Walls: Provide a "double" preformed foam joint at exterior joints, with aesthetic joint at face of veneer masonry, and a functional joint (manufacturer's standard neutral color) in the plane of insulation to maintain continuity of insulation and water and air barriers.

C. Covers in Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

D. Covers in Fire Rated Assemblies: Provide manufacturer's standard fire barrier product, for a complete cover assembly having fire rating equivalent to that of assembly into which it is installed.
   1. Acceptable Evaluation Agencies: UL (DIR) and ITS (DIR).

E. Roof Expansion Joints: Refer to Division 7 Section "Roof Specialties."

2.02 INTERIOR FLOOR JOINTS

A. Interior Floor Joints (Metal; Surface Mounted): Serrated, satin anodized aluminum plate with exposed fasteners. Provide custom sized plate for larger joint width indicated.
   1. Products: (Floor-to-floor and floor-to-wall models)
      a. Balco; RPA-*x* and RPAL-*x*.
      b. Construction Specialties; PCS2G-*xxx* and PCWS2G-*xxx*.
      c. Erie Metal Specialties; ALCP-*xxx* and ALCPW-*xxx*.
      d. Inpro; 808-A01-*xxx* and 808-A02-*xxx*.
      e. MM Systems; X-U-*x* and X-W-*x*.

2.03 INTERIOR WALL JOINTS

A. Interior Wall Joints (Metal; Surface Mounted): Smooth, satin anodized aluminum; with mounting flange on one side of joint and "snap-on" cover installation; no exposed fasteners.
   1. Products: (Wall-to-wall and wall-to-corner models)
      a. Balco; WD-*x* and WDC-*x*.
      b. Construction Specialties; ASM-*xxx* and ASMC-*xxx*.
      c. Erie Metal Specialties; EBWF-*xxx* and EBWF-*xxx*W.
      d. Inpro; 811-A07-*xxx* and 811-A09-*xxx*.
      e. MM Systems; EX-K*x* and EX-L*x*.

2.04 INTERIOR CEILING JOINTS

A. Interior Ceiling Joints (Flush, with Resilient Infill, at Drop-In Ceilings): Coordinate with Division 9 Section "Acoustical Ceilings".
   1. Products: (Ceiling-to-ceiling and ceiling-to-wall models)
      a. Balco; ACWW-*x* and ACWC-*x*.
      b. Construction Specialties; FCS-*xxx* and FCSC-*xxx*.
      c. Erie Metal Specialties; ELCE-*xxx* and ELCE-*xxx*W.
      d. Inpro; 115-A24-*xxx* and 115-A18-*xxx*.
      e. MM Systems; VSG-*xxx* and VSGL-*xxx*.

B. Interior Ceiling Joints (Surface Mounted, with Resilient Infill, at Gypsum Ceilings): Flanges shall be mud-in type to be covered by drywall finisher and shall not be exposed in finished work.
   1. Products: (Ceiling-to-ceiling and ceiling-to-wall models)
      a. Balco; GCWW-*x* and GCWC-*x*.
      b. Construction Specialties; FWF-*xxx* and FWFC-*xxx*.
      c. Inpro; 114-A07-*xxx* and 114-A09-*xxx*.
      d. MM Systems; VSW-*xxx* and VSWL-*xxx*.

2.05 EXTERIOR JOINTS

A. Exterior Wall Joints (Preformed Foam): Pre-compressed and self-expanding, open-cell urethane foam. Pre-coated with water repellant coating on exterior surface, and with adhesive

coating on sides to fit in opening. Joint shall allow for minimum 50% total movement (25% expansion, 25% contraction).

1. Products:
    a. Construction Specialties; Model VF.
    b. EMSEAL Joint Systems, Ltd.; Colorseal.
    c. Erie Metal Specialties; CSS-Series.
    d. MM Systems; Series ESS.
    e. Nystrom; EJN-SES.
    f. Schul International Company, Inc.; Color Econoseal.
    g. Watson Bowman Acme Corp; WeatherSeal II.
    h. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

B. Verify that frames and anchors installed by others are in correct locations and suitable for installation of remainder of assembly.

3.02 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.03 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

B. Where applicable, provide strippable coating or tape to protect finish surface; remove immediately prior to Substantial Completion.

END OF SECTION 079513

SECTION 081113
STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.

I. ASTM C476 - Standard Specification for Grout for Masonry.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities.

M. ITS (DIR) - Directory of Listed Products.

N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.

O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.

P. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames.

Q. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.

R. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

S. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

T. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.

U. UL (DIR) - Online Certifications Directory.

V. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.02 SUBMITTALS

A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

C. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company.
   2. Curries, an Assa Abloy Group company.
   3. Fleming Door Products, an Assa Abloy Group company.
   4. Krieger Specialty Products.
   5. Mesker, dormakaba Group.
   6. Metal Products, Inc. (MPI)
   7. Pioneer Industries, Inc.; an Assa Abloy Group company.
   8. Republic Doors, an Allegion brand.
   9. Steelcraft, an Allegion brand.
   10. Technical Glass Products.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Door Top and Bottom Closures: Flush end closure channel, with top and door faces aligned.
      a. Inverted channel closure is acceptable for bottom edges and top edges of interior doors that are not exposed to view from above.
   4. Door Edge Profile: Beveled edge.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
      a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for

instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated. Fabricate from metallic-coated steel sheet.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Vertical steel stiffeners with fiberglass batts.
      a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
   3. Door Thermal Resistance: R-Value of 6, minimum.
   4. Door Thickness: 1-3/4 inches, nominal.
   5. Weatherstripping: Refer to Division 08 "Door Hardware".

C. Interior Doors, Non-Fire-Rated: Fabricate from either cold-rolled steel sheet or metallic-coated steel sheet.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements, except kraft paper honeycomb core is not acceptable.
   3. Door Thickness: 1-3/4 inches, nominal.

D. Fire-Rated Doors: Comply with NFPA 80.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Match construction and physical performance levels above for interior or exterior doors, as applicable.
   2. Fire Rating: As indicated, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   3. Per NFPA 80, fire exit doors shall be labeled “Fire Door to Be Equipped with Fire Exit Hardware,” and shall be reinforced and constructed to maintain the rating of the specific listed and labeled fire exit devices mounted on them.
   4. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      a. Attach fire rating label to each fire rated unit.
   5. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
   6. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Face welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
   3. Weatherstripping: Refer to Division 08 Section "Door Hardware".

D. Interior Door Frames, Non-Fire Rated: Face welded type.
   1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

E. Door Frames, Fire-Rated: Face welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
   1. Where removable mullion is indicated, coordinate with removable mullion to be provided as an exit device accessory per Division 08 Section "Door Hardware."

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

I. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

J. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

K. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
   1. In Fire-Rated Doors: UL (DIR) or ITS (DIR) listed fusible link louver, same rating as door.
   2. Style: Sightproof inverted V- or Y-blade.
   3. Fasteners: Exposed or concealed fasteners.

B. Glazing: As specified in Section 088000.

C. Removable and Fixed Stops: Formed sheet steel, mitered or butted corners; prepared for countersink style tamper proof screws.
   1. Provide fixed stops for exterior applications, and toward the secure side of interior glazed lites (for example, toward the corridor or more public accessible spaces).

2. Heights of Stops: Unless otherwise indicated or recommended by glazing manufacturer, provide standard 5/8-inch height stops where allowed by standards, and provide 3/4-inch height for exterior 1-inch glazing units.

D. Astragals and Edges for Double Doors: Pairs of door astragals, and door edge sealing and protection devices.
   1. Provide UL listed products, complying with NFPA 80, and as required to maintain indicated fire rating.
   2. Provide surface mounted overlapping-type astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.

E. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

F. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

G. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
   1. Install in accordance with ANSI/SDI A250.11.
   2. Do not remove temporary frame spreaders until after frames have been properly set and secured.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Install door hardware as specified in Section 087100.

F. Comply with glazing installation requirements of Section 088000.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
   1. Comply with clearances indicated in NFPA 80 for fire-rated doors.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ALTERATIONS TO EXISTING HOLLOW METAL DOORS AND FRAMES

A. Modify existing frames in which door swing will be reversed as follows:
   1. Close existing mortise cut-outs with filler plates welded in place and finished flush with metallic body putty. Similarly, close and finish other existing hardware mounting holes or cut-outs. Provide cut-outs in frame to suit mortised hardware. Provide and weld in place new hinge reinforcement. Completed frame shall be free of dents, abrasions, and visible defects in finished surfaces at patched or plugged areas, and be primed and ready for painted finish.
   2. In lieu of modifications indicated above Contractor may remove existing frames and either:
      a. Replace existing frame with similar existing frame indicated to be demolished that is of proper hand for new swing, or:
      b. Provide a post-installed frame as approved into the existing rough opening.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION 081113

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

B. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

C. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

D. UL 10B - Standard for Fire Tests of Door Assemblies.

1.02 SUBMITTALS

A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

C. Selection Samples: Submit manufacturer's color charts indicating full range of available colors, for each product requiring color selection.

D. Verification Samples: Submit three physical samples of door veneer, approximately 8 by 8 inches in size illustrating standard range of wood grain, stain color, and sheen.

E. Warranty, executed in Owner's name.

1.03 QUALITY ASSURANCE

A. Source Limitations: Provide all flush wood doors from a single manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:

1. Lambton Doors; 5-PC/5-FD/SCL as required; Envirodesign series.
2. Oshkosh Door; Architectural Flush Wood Doors.
3. VT Industries, Inc; Heritage Series.

2.02 DOORS

A. Doors: See drawings for locations and additional requirements.

1. Doors shall be manufactured by the hot-press method, bonding faces, crossbands, and core together in a single operation with Type I glue. Doors manufactured by cold-pressing 2- or 3-ply pre-manufactured door skins to multiple cores in the same press will not be accepted.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled.
      a. Provide stile construction with concealed intumescent seals at pairs of doors, meeting required fire-ratings without the need of astragal or metal edge construction.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), particleboard Grade LD-2 per ANSI A 208.1; plies and faces as indicated.
   1. Provide structural-composite-lumber (SCLC) core for doors with glazing area cut out for 9-inch stile width doors.
   2. Provide structural-composite-lumber (SCLC) core for doors with exit devices.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
   1. Vertical Edges: Any option allowed by quality standard for grade.
   2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. For doors indicated to be factory-finished, factory install glazing in doors in compliance with quality standards specified, using manufacturer's standard elastomeric glazing sealant.

E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

G. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent: Provide one of the following AWS finish systems; satin sheen. Stain color shall be selected by Architect from manufacturer's full range.
    a. System 5 - Varnish, Conversion.
    b. System 9 - UV Curable Acrylated Epoxy, Polyester, or Urethane.
    c. System 11 - Polyurethane, Catalyzed.
    d. Stain: Stain to match Architect's sample.

B. Factory finish doors in accordance with approved sample.

C. Seal door top edge with color sealer to match door facing where doors will be exposed to view from above.

2.07 ACCESSORIES

A. Wood Louvers:
    1. Material and Finish: Match species of door panels.

B. Metal Louvers:
    1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.
    2. Louver Blade: Inverted V blade, sight proof, light proof; fire rated to indicated rating, with fusible link designed to UL requirements.

C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws. At fire-rated doors, provide noncombustible wood stops with concealed metal clips for indicated fire rating.

D. Door Hardware: Refer to Section 087100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
    1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION 081416

SECTION 083100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products.

B. UL (FRD) - Fire Resistance Directory.

1.02 SUBMITTALS

A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

B. Shop Drawings: Indicate exact position of each access door and/or panel unit.

1. Include a schedule indicating wall/ceiling type, door types, sizes, and hardware for each access door required.

1.03 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in “Submittals” Article.

1. This (083100) material specification includes access doors required for Divisions 21 (Fire Suppression), Division 22, (Plumbing), 23 (HVAC) and Division 26 (Electrical) work and any other access doors indicated on Drawings.

PART 2 PRODUCTS

2.01 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:

1. Activar Construction Products Group, Inc. - JL Industries.
2. ACUDOR Products Inc.
3. Babcock-Davis.
4. Best Access Doors.
5. Cendrex, Inc.
6. Karp Associates, Inc.
7. Larsen's Manufacturing Company.
8. Milcor, Inc.
9. Nystrom, Inc.
10. Williams Brothers Corporation of America.
11. Substitutions: See Section 016000 - Product Requirements.

B. Wall- and Ceiling-Mounted Units (Interior): Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Material: Steel.
2. Style (Gypsum Board locations): Recessed door panel for infill with wall/ceiling finish.
   a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
3. Style (Masonry locations): Exposed frame, with door surface flush with frame surface.
4. Door Style: Double-skinned hollow panel.

5. Frames: 16-gauge, 0.0598-inch minimum thickness.
6. Double-Skinned Hollow Steel Sheet Door Panels: 16-gauge, 0.059-inch minimum thickness, on both sides and along each edge.
7. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
    a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
    b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
    c. Fire-rated door assemblies shall conform with and be installed in accordance with (1) NFPA 80, (2) door and frame manufacturer's installation instructions, and (3) listing requirements of qualified testing agency.
    d. Provide manufacturer's standard mineral fiber insulation and gasketing.
8. Steel Finish: Factory-primed; for field topcoat to match that used for hollow metal steel doors and frames. Refer to Division 9 Painting for topcoat information.
9. Hardware:
    a. Hardware for Fire-Rated Units: As required for listing.
    b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
    c. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.

C. Security/Detention Access Doors (Interior): Factory-fabricated door and frame, fully assembled units with all joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit. Provide high-security access doors in areas accessible to residents, and medium-security access doors for areas not accessible to residents.
    1. Material: Steel.
    2. Style: Exposed frame, with door surface flush with frame surface.
    3. Access Door Sizes: As indicated on the Drawings.
    4. Frames: As indicated below for high-security or medium-security.
    5. Doors: Single thickness steel plate with steel angle frame/stop.
    6. Steel Finish: Factory-primed; for field topcoat to match that used for hollow metal steel doors and frames. Refer to Division 9 Painting for topcoat information.
    7. High-Security Access Doors:
        a. Frames: Fabricate of minimum 2-inch by 2-inch by 3/16-inch steel angle.
        b. Doors: Fabricate of 10-gauge, 0.135-inch minimum thickness sheet steel.
        c. Hardware:
            1) Hinges: Provide heavy duty steel butt hinges welded to door and frame.
            2) Latch/Lock: Provide access doors prepped for detention deadlock with security type key cylinder by same manufacturer as approved security door hardware (Division 11). Coordinate with security door hardware supplier. Key all secure access doors alike, coordinate with Security Hardware masterkeying.
    8. Medium-Security Access Doors:
        a. Frames: Fabricate of 12-gauge, 0.105-inch minimum thickness sheet steel, with 1-inch exposed flange.
        b. Doors: Fabricate of 12-gauge, 0.105-inch minimum thickness sheet steel.
        c. Hardware:
            1) Hinges: Provide concealed piano hinge.

2) Latch/Lock: Provide manufacturer's standard mortise-type lock. Coordinate with Division 8 Door Hardware for cylinders and facility keying. Key all access door locks alike.

9. Fasteners/Anchors: Provide hot-dip galvanized anchors of type recommended by manufacturer for indicated substrate. Fasteners at all security access doors shall be tamper resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION 083100

SECTION 083323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ITS (DIR) - Directory of Listed Products.

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.

G. NEMA MG 00001 - Motors and Generators.

H. UL (DIR) - Online Certifications Directory.

I. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of coiling doors with size, location and installation of service utilities, including electrical, access control, and smoke/fire alarm, as required.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.03 SUBMITTALS

A. Product Data: Provide general construction, electrical equipment, and component connections and details.
   1. Include product data for automatic closing device for fire shutter application, with testing and resetting instructions.

B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
   1. Include diagrams indicating motors, controls, and electrical wiring.
   2. Indicate coordination with smoke and/or fire alarm systems, and show locations of detectors, replaceable fusible links, and release devices.

C. Selection Samples: Manufacturer's color charts, showing full range of factory finishes.

D. Verification Samples: Manufacturer's standard size sample on curtain slat material indicated.

E. Installer's qualification statement.

F. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified, approved by manufacturer for installation of specified products. Installer shall be located no more than two hours from Project site to allow for maintenance callbacks.

B. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.

C. Source Limitations: Provide coiling doors from a single manufacturer, sourced through a single supplier. Obtain operators and controls from door manufacturer or from a manufacturer that is approved by door manufacturer for compatibility.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide two (2) year manufacturer warranty for materials and workmanship for all components of coiling doors. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors:
1. Alpine Overhead Doors, Inc.
2. Amarr.
3. C.H.I. Overhead Doors.
4. Clopay Building Products.
5. Cornell Iron Works, Inc.
6. McKeon Rolling Steel Door Co., Inc.
7. Overhead Door Corporation.
8. Raynor Garage Doors.
9. The Cookson Company.
10. Wayne-Dalton, a Division of Overhead Door Corporation.
11. Substitutions: See Section 016000 - Product Requirements.

2.02 COILING DOORS

A. Exterior Coiling Doors: Steel slat curtain.
1. Capable of withstanding positive and negative wind loads of 20 psf without undue deflection or damage to components.
2. Sandwich Slats: Manufacturer's standard, with core of foamed-in-place polyurethane insulation; minimum R-value of 4.88.
   a. Surface Burning Characteristics: Provide insulation with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
3. Slat Size: Manufacturer's standard height and thickness to meet performance requirements; length as required for rough opening width indicated.
4. Guide, Angles: Powder coated steel.
5. Hood Enclosure: Manufacturer's standard; powder coated steel.
6. Electric operation.
7. Mounting: Surface mounted.
8. Finish: As selected by Architect from manufacturer's full range of powder coat finishes.

2.03 MATERIALS AND COMPONENTS

A. Metal Curtain Construction: Interlocking slats.
   1. Curtain Bottom for Slat Curtains: Fitted with steel angles to provide reinforcement and positive contact in closed position; powder coated to match curtain slats.
   2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
   3. Steel Slats: Minimum thickness, 22 gauge, 0.0299 inch; ASTM A653/A653M galvanized steel sheet, unless otherwise indicated.
      a. Galvanizing: Minimum G90 coating at all doors.

B. Guide Construction: Continuous, of profile to retain door in place, mounting brackets of same metal.

C. Guides - Angle: Two ASTM A36/A36M metal angles, size as required for wind loading, but not less than 1-1/2 by 1-1/2 by 1/8 inch.
   1. Powder coated to match curtain slats.
   2. Coordinate jamb conditions and angle requirements with the work of security drawings, Division 28 Security/Access Control sections, and with the Security Control Systems Contractor (SCSC) for security door position switch and interlocking requirements indicated.

D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
   1. Minimum Thickness: 0.028-inch; ASTM A653/A653M galvanized steel sheet with G90 coating.
   2. Provide with end mounting brackets and with intermediate reinforcing brackets to prevent sagging.
   3. Powder coated to match curtain slats.

E. Lock Hardware:
   1. For motor operated units, additional lock or latching mechanisms are not required.

F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide interlock switches on motor operated units.
   2. Operation Cycles: Provide operators and components that are tested and rated for a minimum of 20,000 cycles, unless otherwise indicated.

B. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure:
      a. Exterior Coiling Doors: NEMA MG 00001, Type 4; open drip proof.
      b. Interior Coiling Doors: NEMA MG 00001, Type 1; open drip proof.
   3. Motor Rating: 1/2 HP; continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA EN 10250, Type 4.
   7. Brake: Manufacturer's standard type, activated by motor controller.

8. Manual override in case of power failure.
9. Refer to Division 26 and electrical drawings for electrical connections.

C. Control Station: Provide standard three button, 'Open-Close-Stop' momentary-contact control device for each operator complying with UL 325.
   1. Surface mounted, at interior door jamb.
   2. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide NEMA 4X photo eye sensors as required with momentary-contact control device.
         1) Mount primary photo eye sensor no more than 6 inches above finish floor level.
      b. Secondary Device: Provide non-monitored pneumatic sensing edge; may also serve as weatherstripping for bottom of door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that electrical services have been installed and are accessible.

C. Verify that door opening is plumb, header is level, and dimensions are correct.

D. Notify Architect of any unacceptable conditions or varying dimensions.

E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Division 26 electrical sections.

F. Complete wiring from disconnect to unit components.

G. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

B. Adjust seals around entire perimeter to ensure a weather-tight installation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

3.06 FIELD QUALITY CONTROL, DEMONSTRATION, AND INITIAL MAINTENANCE SERVICE

A. Field Testing and Demonstration: Field testing shall be performed by manufacturer's authorized service representative.
   1. Complete final installation, testing, and adjustment procedures in accordance with manufacturer's instructions.
   2. Provide a minimum of 2 hours training and demonstration to Owner's maintenance personnel for operation, adjustment, and maintenance of doors.

B. Provide an Initial Maintenance Contract for maintenance of coiling door system and components for a period of 12 months. Maintenance shall include maximum quarterly intervals (minimum of 4 visits for initial contract), and shall include adjustment, lubrication, and other preventive maintenance, and repair or replacement of defective or worn parts or equipment.
   1. Provide service during regular working hours throughout period of this maintenance contract.

END OF SECTION 083323

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

C. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.

D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

G. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

H. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

J. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.03 SUBMITTALS

A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

C. Selection Samples: Submit manufacturer's color charts representing manufacturer's full range of available colors, for each type of product required.

D. Verification Samples: Submit physical samples in manufacturer's standard size indicating actual panel material and selected colors, for each type of product required.

E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

G. Designer's qualification statement.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.06 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Material/Labor Warranty: Provide a 2-year material and workmanship warranty, covering failures including but not limited to, structural and performance failures, excessive material deterioration, failure of operating components, and water or air infiltration. Complete forms in Owner's name and register with warrantor.

C. Finish Warranty: Provide 10-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefront - Exterior - Single Thermal Break - Center Set - 2" x 4.5":
   1. EFCO Corp; 403T.
   2. Kawneer North America; 451T.
   3. Oldcastle Building Envelope; 3000 Thermal.
   4. Tubelite, Inc; T14000 Thermal.
   5. YKK AP America, Inc; YES 45 TU.

B. Aluminum-Framed Storefront - Interior - Non-Thermal - Center Set - 2" x 4.5":
   1. EFCO Corp; 402.
   2. Kawneer North America; Trifab VG 451.
   3. Oldcastle Building Envelope; FG 3000.
   4. Tubelite, Inc; E14000 Non-Thermal.
   5. YKK AP America, Inc; YES 45 FI.

C. Aluminum-Framed Entrance - Exterior - Thermally Broken/Insulated - Wide Stile. Thickness varies by manufacturer; coordinate hardware requirements with submitted product depth:
   1. EFCO Corp; 2" ThermaStile Aluminum Swing Entrance Doors. (2")
   2. Kawneer North America; 500T Insulpour. (2-1/4")

3. Oldcastle Building Envelope; WS-500TC. (2-1/4")
4. Tubelite, Inc; Therml=Block Entrance. (1-3/4")
5. YKK AP America Inc; 50T. (2")

D. Aluminum-Framed Entrance - Interior - Standard - Uninsulated - 1.75-inch Thick - Wide Stile:
1. EFCO Corp; D500.
2. Kawneer North America; 500.
3. Oldcastle Building Envelope; 500.
4. Tubelite, Inc; Standard Wide Stile Doors.
5. YKK AP America, Inc; 50D.

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
1. Glazing Position: Centered (front to back).
2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements:
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
a. Design Wind Loads: Comply with requirements of ASCE 7 and as indicated on Structural drawings.
b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 10 psf.
3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
4. Condensation Resistance Factor of Framing: 56, minimum, measured in accordance with AAMA 1503.
5. Overall U-value Including Glazing (Fixed Glazing): 0.42 Btu/(hr sq ft deg F), maximum.
6. Overall U-value Including Glazing (Entrance Doors): 0.68 Btu/(hr sq ft deg F), maximum.

7. Solar Heat Gain Coefficient (SHGC) Including Glazing: 0.25, maximum, measured in accordance with NFRC 200.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.

B. Glazing: Refer to Section 088000.

C. Swing Doors: Glazed aluminum.
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 7 inches wide.
   3. Vertical Stiles: 5 inches wide (wide stile).
   4. Bottom Rail: 12 inches wide.
   5. Glazing Stops: Beveled.
   6. Finish: Same as storefront.

2.04 MATERIALS AND ACCESSORIES

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Metal Extrusions and Accessories:
   1. Metal Trim, Filler, and Closures (Brake Metal): Form interior filler panels for closing ends of partition systems, concealing adjacent structural elements, and for other applications as indicated on Drawings. Form from minimum 0.050-inch aluminum sheet coil, producing a panel of same thickness as partitions or mullions unless otherwise indicated. Incorporate reveals, trim, and concealed anchorages for attaching to adjacent surfaces. Finish trim to match storefront unless otherwise indicated.
   2. Offset Anchorage System: Provide frame anchorage incorporating L-shaped offset anchors or strap anchor component, and finished extruded interlocking L-shaped cover trim matching storefront framing. Anchorage "clip and cover" system shall be engineered by storefront manufacturer.
   3. Enhanced (High Performance) Sill Flashing: Provide thermally-broken extruded aluminum sill flashing with 2-inch tall back leg and bottom profile with outboard trough and weep holes to direct water to exterior. Provide full-frame-depth end dams mechanically attached to sill flashing extrusion and sealed with silicone. Provide silicone sill flashing splice sleeves and sealant as required at end dams and penetrations for anchorage. Provide finish to match framing.

D. Sill Flashing Sealant: Elastomeric silicone; compatible with flashing material.

E. Sealant for Setting Thresholds: Non-curing butyl type.

F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.05 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Color: To be selected by Architect from manufacturer's full range.

2.06 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: Refer to Section 087100.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all exterior doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install glass using glazing method required to achieve performance criteria; see Section 088000.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 084313

SECTION 085653
SECURITY WINDOWS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

F. SSPC-Paint 33 - Coal Tar Mastic Coating, Cold-Applied.

G. UL (DIR) - Online Certifications Directory.

H. UL 752 - Standard for Bullet-Resisting Equipment.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Furnish anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, to be embedded into concrete or masonry, with setting diagrams and installation, to applicable installer in time for installation.

B. Preinstallation Meeting: Prior to start of installation arrange a meeting on site to familiarize installer and installers of related work with requirements relating to this work.

1.03 SUBMITTALS

A. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.

B. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.
   1. For existing and in-place openings show verified field dimensions.
   2. Show required opening dimensions and allowance for field deviation.

C. Test Reports: Test reports for specific window model and glazing to be furnished, showing compliance with specified requirements; window and glazing may be tested separately, provided window test sample adequately simulates the glazing to be used.
   1. Include testing agency qualifications.
   2. For structural, forced entry, and ballistic tests, provide details on method of anchorage to test frame.
   3. Reports for thermal requirements may be based on calculations, in accordance with the specified standard.

D. Selection Samples: Color charts for factory finishes.

E. Verification Samples:

1. Actual sections of frame members, at least 12 inch long, showing finish, weatherstripping, and fasteners.

F. Installer's Qualification Statement.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent testing agency able to show experience in conducting tests of the type specified.

B. Installer Qualifications: Company specializing in performing work of the type specified; certified or approved in writing by security window manufacturer.

C. Welder Qualifications: Qualified in accordance with AWS procedures for type of welding required.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within three years after Date of Substantial Completion due to, but not limited to, the following:

1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under normal weathering.
2. Failure of glazing due to excessive deflection of supporting members under wind load.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Security Transaction Windows with Pass-Through Device:

1. Armortex.
2. Chicago Bullet Proof Systems.
3. C. R. Laurence Co., Inc.
4. Creative Industries, Inc.
5. Insulgard Security Products.
6. Krieger Specialty Products.
7. National Bullet Proof, Inc.
8. Norshield Security Products.
9. Overly Door Company.
10. Total Security Solutions.
11. United States Bullet Proofing, Inc.

B. Source Limitations: Provide windows from a single manufacturer.

2.02 ASSEMBLIES

A. Security Windows, General:

1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures; see Section 016000.
2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
3. Fabricate frames and sash with corners mitered or coped full depth with concealed welded joints.

4. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
5. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
6. Weld components before finishing and in concealed locations, to greatest extent possible; minimize distortion and discoloration of finish; remove residue of welding; grind exposed welds smooth and finish to match.
7. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.

2.03 SECURITY TRANSACTION WINDOWS WITH PASS-THROUGH DEVICE

A. Security Transaction Windows with Pass-Though Device:
   1. Location: Built within interior wall, as indicated on drawings.
   2. Ballistic Resistance: Tested to meet UL 752, Level 3.
   3. Window Type: Fixed.
      a. Overall Window Frame Size: As indicated on drawings.
      b. Frame Material: Aluminum.
   4. Glazing: Manufacturer's standard, clear, bullet resistant; matching UL 752 level indicated above. Provide insulated glazing unit for exterior applications as applicable.
   5. Pass-Through Device: Ricochet-resistant deal tray.
   6. Communication: Stainless-steel, amplified talk-through portal.

2.04 ASSEMBLY COMPONENTS

A. Aluminum Framing: ASTM B221 (ASTM B221M) extrusions of alloy and temper selected by manufacturer for strength, corrosion resistance, and finish required; not less that 1/8 inch thick at any location of frame and sash members.
   1. Provide thermally broken framing for exterior window applications, as applicable.

B. Steel Reinforcement: Where required by manufacturer to comply with UL 752 rating, provide steel reinforcement, galvanized or zinc-rich primer coated, and complying with ASTM A36/A36M for steel shapes, plates and bars, and ASTM A1008/A1008M for cold-rolled steel sheet.

C. Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten windows to adjacent construction; use security fasteners for exposed anchors.
   1. For Setting in Masonry: Minimum 3/16 inch thick angles or plates, minimum 4 inches long with hooked ends, welded to back of window frame.
   2. Provide minimum of two anchors per side of window plus one additional anchor for each 18 inches or fraction thereof more than 36 inches in height or width.

D. Glazing: Manufacturer's standard, factory-glazed glass-clad polycarbonate meeting bullet resistance requirements indicated.
   1. Bullet Resistance: Tested to UL 752. Glazing rating shall match the UL 752 level indicated for the security window as a complete assembly.

E. Glazing Seals: Factory installed; molded EPDM or neoprene compressible gaskets and compression strips.

F. Security Fasteners: Operable only by tools produced by fastener manufacturer or manufacturer's licensee; head style appropriate to installation conditions, strength, and finish of materials being fastened; use countersunk heads wherever possible.

G. Deal Trays: Formed stainless steel, recessed into counter or sill for mounting under glazing frame.
   1. Style: Ricochet-resistant, with recessed bullet trap on secure side, with sliding cover.
   2. Clear Opening Height: 1-1/2 inches.
   3. Tray Dimensions: 16 by 11 inches, wide by deep.
   4. Listed and labeled by UL as bullet resisting to UL 752 Level 3.

H. Speaking Aperture Covers: Stainless steel, round, battery-operated amplified unit allowing passage of speech without distortion; listed and labeled by UL (DIR) as bullet resisting to UL 752, Level 3.

I. Bituminous Paint: Cold-applied asbestos-free asphalt mastic, complying with SSPC-Paint 33; 30 mils, 0.030 inch minimum thickness per coat.

J. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 FINISHES

A. Fluoropolymer Finish: Cleaned and pretreated; two coat thermosetting finish containing not less than 70 percent polyvinylidene fluoride resin by weight, complying with AAMA 2604; 1.5 to 2 mils thick, applied in accordance with paint manufacturer's recommendations; medium gloss.

B. Color: To be selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

C. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings.

B. Install windows in correct orientation (inside/outside or secure/non-secure).

C. Anchor windows securely in manner so as to achieve performance specified.

D. Separate metal members from concrete and masonry using bituminous paint.

E. Separate dissimilar metals, and metal members in contact with concrete and masonry, using bituminous paint.

3.03 ADJUSTING

A. Adjust operating components for smooth operation while also providing tight fit at contact points and a secure enclosure; lubricate operating hardware.

3.04 CLEANING AND REPAIR

A. Clean exposed surfaces promptly after installation without damaging finishes.

B. Remove and replace defective work.

END OF SECTION 085653

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Stile and Rail Wood Doors"
   d. "Interior Aluminum Doors and Frames"
   e. "Aluminum-Framed Entrances and Storefronts"
   f. "Stainless Steel Doors and Frames"
   g. "Special Function Doors"
   h. "Entrances"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:
      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.
      5) Location of each hardware set cross-referenced to indications on Drawings.
      6) Explanation of all abbreviations, symbols, and codes contained in schedule.
      7) Mounting locations for hardware.
      8) Door and frame sizes and materials.
      9) Degree of door swing and handing.
      10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
   b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Final approved hardware schedule edited to reflect conditions as installed.

d. Final keying schedule
e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
   a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
   b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference
   a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      2) Preliminary key system schematic diagram.
      3) Requirements for key control system.
      4) Requirements for access control.
      5) Address for delivery of keys.

2. Pre-installation Conference
   a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Inspect and discuss preparatory work performed by other trades.
   c. Inspect and discuss electrical roughing-in for electrified door hardware.
   d. Review sequence of operation for each type of electrified door hardware.
   e. Review required testing, inspecting, and certifying procedures.
   f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: ''No Substitute.''

    1. Where ''No Substitute'' is noted, submittals and substitution requests for other products will not be considered.

B. Approval of alternate manufacturers and/or products other than those listed as ''Scheduled Manufacturer'' or ''Acceptable Manufacturers'' in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

C. Approval of products from manufacturers indicated in ''Acceptable Manufacturers'' is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

    1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
    2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
    3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

    1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

    1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
    2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
    3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Ives 5BB series

2. Acceptable Manufacturers and Products:
   a. McKinney TB series
   b. Best FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:
   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Select
   b. ABH

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.

2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:
   a. ABH PT1000
   b. Security Door Controls PTM

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.08 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage L9000 series

2. Acceptable Manufacturers and Products:
   a. Accurate 9000/9100 series
   b. Sargent 8200 series

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches. Provide motor based electrified and motor based latch retraction locksets that comply with the following requirements:

a. Low holding current (Lever control or latch retraction) – maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications and motorized latch retraction applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
b. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
c. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
d. Low maximum current draw – maximum 0.4 amps (Lever control) and maximum 2.0 amps (Latch retraction) to allow for multiple locks on a single power supply.
e. Connections – provide quick-connect Molex system standard.

8. (OPTION Key Override) Provide locks with a key override feature built into the chassis that allows the outside key to retract the deadbolt and/or latchbolt, overriding the inside thumbturn when it is being held in the locked position - where the XL13-439 option is specified in the hardware sets.
9. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
   a. (OPTION Vandlgard) Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.
   b. Lever Design: 06A (Rhodes).

2.09 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:
   a. Detex Advantex series
   b. Precision APEX 2000 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices at pool gates with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Provide exit devices with manufacturers' approved strikes.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.

11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
17. Special Options:
    a. CX
        1) Provide delayed egress devices, where scheduled, that are UL 294 listed, meet National Fire Protection Association (NFPA) and International Building Code (IBC) governing delayed egress, and/or other local and national fire codes acceptable to authority having jurisdiction as required.
            a) Provide non-handed and field sizable device with 3/4 (19mm) throw deadlocking latch bolt. Device incorporates an internal RX switch that detects attempt to exit from applying less than 15lbs to the push pad, which causes this switch to start an irreversible alarm cycle. Key switch in device is capable of arming, disarming, or resetting the device; and indicator lamp determines status of the device.
            b) Provide devices capable of standard 15 second release delay and indefinite release delay as required by code, when tied into fire alarm system will release immediately when an alarm condition exists.
            c) Provide devices with all control inputs – door position input, external inhibit input, fire alarm input; auxiliary locking; nuisance alarm and internal horn; and, remote signaling output self-contained in the device assembly.

2.10 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. Schlage Everest 29 Primus XP

2. Acceptable Manufacturers and Products:
    a. Sargent DG3
    b. Medeco 4

B. Requirements:

1. Provide cylinders/cores, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
    a. High Security: dual-locking cylinder with permanent core requiring restricted, patented keyway. Dual-locking mechanism with interlocking finger pin(s) to check for patented features on keys.

3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.

4. Nickel silver bottom pins.

2.11 KEYING

A. Scheduled System:

1. New factory registered system:
   a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
   a. Replaceable Construction Cores.
      1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         a) 3 construction control keys
         b) 12 construction change (day) keys.
      2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:
   a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      1) Master Keying system as directed by the Owner.
   b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
   c. Provide keys with the following features:
      1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
      2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
      3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.
   d. Identification:
      1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
      2) Identification stamping provisions must be approved by the Architect and Owner.
      3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
      4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
      5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
   e. Quantity: Furnish in the following quantities.
      1) Permanent Control Keys: 3.
      2) Master Keys: 6.
      3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
      4) Key Blanks: Quantity as determined in the keying meeting.

2.12 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Telkee

2. Acceptable Manufacturers:
   a. HPC
   b. Lund

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
   a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
   b. Provide hinged-panel type cabinet for wall mounting.

2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN 4010/4110/4020 series

2. Acceptable Manufacturers and Products:
   a. Corbin-Russwin DC8000 series
   b. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).

10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.14 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.15 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.16 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

2. Acceptable Manufacturers:
   a. Rixson
   b. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.17 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.18 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Steelcraft
   b. Republic

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Scheduled Manufacturer:

1. Zero International

B. Acceptable Manufacturers:

1. National Guard
2. Reese

C. Seals and Gasketing: Provide continuous gasketing on exterior openings, to the head and jambs, forming a continuous seal between the door and the frame. Provide smoke, light, or sound gasketing on interior doors where indicated.

1. Provide self-tapping fasteners for aluminum extruded gasketing being applied to hollow metal frames.
   a. Provide non-corrosive fasteners for all exterior applications.
   b. Provide security fasteners where indicated.

2. Provide neoprene, EPDM, silicone, or nylon brush inserts as specified in hardware sets. Provide non brush inserts of solid or sponge cell, as specified in hardware sets. Vinyl inserts are not allowed except where specified in hardware sets.

D. Smoke Labeled Gasketing: At all smoke labeled openings, provide smoke listed perimeter gasketing assemblies complying with NFPA 105 listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for smoke control ratings indicated based on testing according to UL 1784.

E. Fire Listed Gasketing: Assemblies complying with NFPA 80 that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction for fire ratings indicated based on testing according to UL-10C.

1. Where frame-applied intumescent seals are required by the manufacturer, provide gaskets that comply with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies and UBC 7-2, Fire Tests of Door Assemblies.

F. Sound-Rated Gasketing: Provide acoustic gasketing to meet Sound Transmission Class (STC) rating required.

G. Meeting-Stile Gasketing: Provide meeting-stile gasketing that fastens to the meeting stiles forming a continuous seal when doors are closed.

H. Door Sweeps or Shoes: Apply to the bottom of the door to close the gap between the door bottom and finished floor or saddle threshold.

1. Provide solid neoprene, EPDM, silicone, or nylon brush type of seal as specified in hardware sets. Vinyl inserts are not allowed except where specified in hardware sets.

I. Automatic Door Bottoms:

1. Provide closed cell sponge, bulb neoprene. or EPDM type of seal as specified in hardware sets.
2. Door bottom to be mortised, semi mortised, or surface mount as with a minimum thickness as specified in hardware sets.

J. Rain Drips:

1. Provide overhead rain drips for out-swinging hollow metal doors that are not covered against 45 degree blowing rain. Aluminum extrusion to be a minimum of .088 inches thick and extend 2.50 inches from the face of the frame, in anodized finish to match door.
2. Door sweeps or shoes with integral rain drip must meet ADA requirements

K. Thresholds: Provide threshold units not less than 4 inches wide, formed to accommodate change in floor elevation where indicated, and fabricated to accommodate door hardware and fit door frames.

1. Threshold extrusion to be a minimum thickness as specified in hardware sets.

2.20 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Schlage

2. Acceptable Manufacturers:
   a. GE-Interlogix
   b. Sargent

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.21 COAT HOOKS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Provide coat hooks as specified.

2.22 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

P. Thresholds:

1. Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
2. Aluminum thresholds to be cut-in, and scribed around mullions, frame members, and stops. Do not butt to thresholds. Provide a continuous surface across full width of opening from jamb to jamb.
3. Where aluminum panic-type (rabbeted) thresholds with neoprene inserts are specified, undercut doors as required to properly mate with seal in threshold.

Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

R. Perimeter Gasketing:

1. Apply to head and jamb, forming seal between door and frame.
2. Install gasketing in a manner eliminating need to cut any seal to install surface mounted hardware. Install compatible mounting bracket for surface mounted hardware unless minimum 1/4 inch thick solid aluminum seals are provided for mounting of surface applied hardware.

S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

   1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

Legend:
Link to catalog cut sheet
Electrified Opening

Hardware Group No. 01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	PANIC HARDWARE	CD-98-NL-OP-110MD		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX		626	SCH
2	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	90 DEG OFFSET PULL	8190HD 10" O		630	IVE
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

Hardware Group No. 02

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

GENERAL CONTRACTOR TO COORDINATE SPECIFIED HARDWARE WITH BULLET RESISTANT DOOR SYSTEM SUPPLIER.

Hardware Group No. 03

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
2	EA	MANUAL FLUSH BOLT	FB358		626	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP & HOLDER	90H		689	GLY
1	EA	SURFACE CLOSER	4111 SHCUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 04

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY EPT		628	IVE
1	EA	POWER TRANSFER	EPT10 CON	✓	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-98-NL-OP-CON 24 VDC	✓	626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	90 DEG OFFSET PULL	8190HD 10" O		630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	655A		A	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
1	EA	DOOR CONTACT	679-05HM	✓	BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS EXIT DEVICE LATCH BOLT ALLOWING ENTRY. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 05

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	L9040 06A 09-544 OS-OCC		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	COAT AND HAT HOOK	582		626	IVE

Hardware Group No. 06

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX CON 12/24 VDC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 07

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP			652	IVE
1	EA	POWER TRANSFER	EPT10 CON		✓	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX CON 12/24 VDC		✓	626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
3	EA	SILENCER	SR64			GRY	IVE
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)				VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)				VON
1	EA	DOOR CONTACT	679-05HM		✓	BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				

GENERAL CONTRACTOR TO COORDINATE SPECIFIED HARDWARE WITH BULLET RESISTANT DOOR SYSTEM SUPPLIER.

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE AND BYPASSES DOOR CONTACT, SIGNALING AUTHORIZED ENTRY. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, REQUEST TO EXIT (RX) IN THE LEVER HANDLE BYPASSES DOOR CONTACT SIGNALING AUTHORIZED EGRESS. FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 08

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY W/DEADBOLT W/ OUTSIDE INDICATOR	L9440 06A 09-544 OS-OCC		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	COAT AND HAT HOOK	582		626	IVE

Hardware Group No. 09

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	L9010 06A		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

Hardware Group No. 10

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	L9010 06A		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 11

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW SH 4.5 X 4.5 NRP			652	IVE
1	EA	POWER TRANSFER	EPT10 CON		✓	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX LX CON 12/24 VDC		✓	626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
3	EA	SILENCER	SR64			GRY	IVE
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)				VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)				VON
1	EA	DOOR CONTACT	679-05HM		✓	BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 12

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 13

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 14

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY W/DEADBOLT W/ OUTSIDE INDICATOR	L9440 06A 09-544 OS-OCC		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	COAT AND HAT HOOK	582		626	IVE

Hardware Group No. 15

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP			652	IVE
1	EA	POWER TRANSFER	EPT10 CON		✓	689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX LX CON 12/24 VDC		✓	626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
3	EA	SILENCER	SR64			GRY	IVE
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)				VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)				VON
1	EA	DOOR CONTACT	679-05HM		✓	BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 16

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX LX CON 12/24 VDC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 17

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP	90S		689	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 18

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX LX CON 12/24 VDC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP	90S		689	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 19

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY W/DEADBOLT W/ OUTSIDE INDICATOR	L9440 06A 09-544 OS-OCC		626	SCH
1	EA	OH STOP	90S		689	GLY
1	EA	SURFACE CLOSER	4011 SRI		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	COAT AND HAT HOOK	582		626	IVE

Hardware Group No. 20

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP	90S		689	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

Hardware Group No. 21

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	OFFICE W/SIM RETRACT	L9056T 06A 09-544		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	THRESHOLD	545A		A	ZER

Hardware Group No. 22

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP			652	IVE
1	EA	POWER TRANSFER	EPT10 CON			689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX CON 12/24 VDC			626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA			AA	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)				VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)				VON
1	EA	DOOR CONTACT	679-05HM			BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 23

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY W/DEADBOLT W/ OUTSIDE INDICATOR	L9440 06A 09-544 OS-OCC		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	COAT AND HAT HOOK	582		626	IVE

Hardware Group No. 24

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	224XY		628	IVE
1	EA	PUSH/PULL BAR	9190HD-10"-NS		630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 25

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX CON 12/24 VDC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 26

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5			652	IVE
1	EA	OFFICE W/SIM RETRACT	L9056T 06A 09-544			626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	OH STOP & HOLDER	90H			689	GLY
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA			AA	ZER
1	EA	THRESHOLD	545A			A	ZER

Hardware Group No. 27

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5			652	IVE
1	EA	POWER TRANSFER	EPT10 CON			689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX LX CON 12/24 VDC			626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA			AA	ZER
1	EA	THRESHOLD	545A			A	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)				VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)				VON
1	EA	DOOR CONTACT	679-05HM			BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 28

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX CON 12/24 VDC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 29

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 06A	626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA	AA	ZER

Hardware Group No. 30

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP			630	IVE
1	EA	POWER TRANSFER	EPT10 CON		✓	689	VON
1	EA	EL MORTISE LOCK	L9095TEL 06A RX LX CON 12/24 VDC		✓	626	SCH
2	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	SET	GASKETING	429AA-S			AA	ZER
1	EA	DOOR SWEEP	8192AA			AA	ZER
1	EA	THRESHOLD	545A-V3-223			A	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)				VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)				VON
1	EA	DOOR CONTACT	679-05HM		✓	BLK	SCE
2	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				

1. DOOR NORMALLY CLOSED AND LOCKED FROM BOTH SIDES.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. EGRESS BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS INSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
4. UPON LOSS OF POWER, DOOR TO REMAIN CLOSED AND UNLOCKED (FAIL SAFE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 31

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	L9010 06A		626	SCH
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 32

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	CONST LATCHING BOLT	FB51P		630	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	EU MORTISE LOCK	L9092TEU 06A RX LX CON 12/24 VDC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	COORDINATOR	COR X FL		628	IVE
2	EA	OH STOP	90S		689	GLY
2	EA	SURFACE CLOSER	4011		689	LCN
2	EA	ARMOR PLATE	8400 36" X 1" LDW B-CS		630	IVE
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	MEETING STILE	383AA		AA	ZER
2	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	545A-V3-223		A	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
2	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

1. DOORS NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, DOORS TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 33

Provide each RU door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	ALL HARDWARE	PROVIDED BY OVERHEAD DOOR SUPPLIER		

Hardware Group No. 34

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	224XY EPT			628	IVE
1	EA	POWER TRANSFER	EPT10 CON		✓	689	VON
1	EA	DELAYED PANIC HARDWARE	CX9875-L-M996-06-FSE-CON 24 VDC		✓	626	VON
2	EA	MORTISE CYLINDER	20-061 ICX			626	SCH
2	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	LOCK GUARD	LG1			630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	RAIN DRIP	142AA			AA	ZER
1	SET	GASKETING	429AA-S			AA	ZER
1	EA	DOOR SWEEP	8192AA			AA	ZER
1	EA	THRESHOLD	655A			A	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)				VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)				VON
1	EA	DOOR CONTACT	679-05HM		✓	BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				
2	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				

1. DOOR NORMALLY CLOSED AND LOCKED ON BOTH SIDES.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE. KEY OVERRIDE AVAILABLE.
3. AUTHORIZED EGRESS BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY BYPASSES DELAYED EGRESS LOCK.
4. UNAUTHORIZED EGRESS BY PUSHING ON DOOR WILL INITIATE IRREVOCABLE 15 SECOND ALARM BEFORE DOOR WILL UNLOCK AND ALLOW EGRESS OUT OF THE BUILDING.
5. UPON LOSS OF POWER, OR ACTIVATION OF FIRE ALARM SYSTEM, OUTSIDE DOOR LEVER TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
6. UPON LOSS OF POWER, OR ACTIVATION OF FIRE ALARM SYSTEM, INSIDE DELAYED EGRESS MECHANISM TO DISARM, ALLOWING FREE AND IMMEDIATE EGRESS.
7. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 35

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP	90S		689	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER

Hardware Group No. 36

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	EU MORTISE LOCK	L9092TEU 06A RX LX CON 12/24 VDC		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP	90S		689	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	AUTO DOOR BOTTOM	369AA		AA	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

GENERAL CONTRACTOR TO COORDINATE SPECIFIED HARDWARE WITH BULLET RESISTANT DOOR SYSTEM SUPPLIER.

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER HANDLE AND BYPASSES DOOR CONTACT, SIGNALING AUTHORIZED ENTRY. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, REQUEST TO EXIT (RX) IN THE LEVER HANDLE BYPASSES DOOR CONTACT SIGNALING AUTHORIZED EGRESS. FREE EGRESS AT ALL TIMES.
4. UPON LOSS OF POWER, OR ACTIVATION OF FIRE ALARM SYSTEM, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
5. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. 37

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM W/DEADBOLT	L9480T 06A 09-544		630	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	LOCK GUARD	LG1		630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	655A		A	ZER

Hardware Group No. 38

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	L9010 06A		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 39

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP	90S		689	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 40

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP	90S		689	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 41

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OH STOP & HOLDER	90H		689	GLY
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 42

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 43

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	L9080T 06A		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 44

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	ALL HARDWARE	PROVIDED BY DOOR & FRAME SUPPLIER		

Hardware Group No. ALD-01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY EPT		628	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-98-NL-OP-CON 24 VDC		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	90 DEG OFFSET PULL	8190HD 10" O		630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	CUSH SHOE SUPPORT	4110-30 SRT		689	LCN
1	EA	BLADE STOP SPACER	4110-61 SRT		689	LCN
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING/SEALS	PROVIDED BY DOOR & FRAME MANUFACTURER			
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	655A		A	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

1. DURING SPECIFIED HOURS:
2. DOOR CAN BE UNLOCKED BY ACCESS CONTROL SYSTEM.
3. IN THE EVENT OF AN EMERGENCY, DOOR CAN BE LOCKED BY SWITCH INSIDE OF VESTIBULE AT OPENING 100 B.

1. DURING NON-SPECIFIED HOURS:
2. DOOR CLOSED AND LOCKED.
3. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS EXIT DEVICE LATCH BOLT ALLOWING ENTRY. KEY OVERRIDE AVAILABLE.

1. AT ALL TIMES:
2. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
3. UPON LOSS OF POWER, OR ACTIVATION OF FIRE ALARM SYSTEM, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
4. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. ALD-02

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	112XY EPT			628	IVE
1	EA	POWER TRANSFER	EPT10 CON			689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL-OP-CON 24 VDC			626	VON
1	EA	RIM CYLINDER	20-057 ICX			626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	90 DEG OFFSET PULL	8190HD 10" O			630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH			689	LCN
1	EA	CUSH SHOE SUPPORT	4110-30 SRT			689	LCN
1	EA	BLADE STOP SPACER	4110-61 SRT			689	LCN
1	EA	GASKETING/SEALS	PROVIDED BY DOOR & FRAME MANUFACTURER				
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)				VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)				VON
1	EA	DOOR CONTACT	679-05HM			BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				
1	EA	EMERGENCY LOCKDOWN BUTTON	PROVIDED BY SECURITY INTEGRATOR				

1. DURING SPECIFIED HOURS:
2. DOOR CAN BE UNLOCKED BY ACCESS CONTROL SYSTEM.
3. IN THE EVENT OF AN EMERGENCY, DOOR 100 A CAN BE LOCKED BY SWITCH INSIDE OF VESTIBULE AT OPENING 100 B.

1. DURING NON-SPECIFIED HOURS:
2. DOOR CLOSED AND LOCKED.
3. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS EXIT DEVICE LATCH BOLT ALLOWING ENTRY. KEY OVERRIDE AVAILABLE.

1. AT ALL TIMES:
2. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
3. UPON LOSS OF POWER, OR ACTIVATION OF FIRE ALARM SYSTEM, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
4. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. ALD-03

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY EPT		628	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-35A-NL-OP-388-CON 24 VDC		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	90 DEG OFFSET PULL	8190HD 10" O		630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH		689	LCN
1	EA	CUSH SHOE SUPPORT	4110-30 SRT		689	LCN
1	EA	BLADE STOP SPACER	4110-61 SRT		689	LCN
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING/SEALS	PROVIDED BY DOOR & FRAME MANUFACTURER			
1	EA	DOOR SWEEP	8192AA		AA	ZER
1	EA	THRESHOLD	655A		A	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)			VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)			VON
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR			
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR			

GENERAL CONTRACTOR TO COORDINATE SPECIFIED HARDWARE WITH BULLET RESISTANT DOOR SYSTEM SUPPLIER.

1. DOOR NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS EXIT DEVICE LATCH BOLT ALLOWING ENTRY. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, REQUEST TO EXIT (RX) IN PANIC DEVICE PUSH PAD WILL BYPASS DOOR CONTACT SIGNALING AUTHORIZED EGRESS. FREE EGRESS AT ALL TIMES.
4. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. ALD-04

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	112XY EPT			628	IVE
1	EA	POWER TRANSFER	EPT10 CON			689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-98-NL-OP-CON 24 VDC			626	VON
1	EA	RIM CYLINDER	20-057 ICX			626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	90 DEG OFFSET PULL	8190HD 10" O			630	IVE
1	EA	SURFACE CLOSER	4111 SCUSH			689	LCN
1	EA	CUSH SHOE SUPPORT	4110-30 SRT			689	LCN
1	EA	BLADE STOP SPACER	4110-61 SRT			689	LCN
1	EA	RAIN DRIP	142AA			AA	ZER
1	EA	GASKETING/SEALS	PROVIDED BY DOOR & FRAME MANUFACTURER				
1	EA	DOOR SWEEP	8192AA			AA	ZER
1	EA	THRESHOLD	655A			A	ZER
1	EA	WIRE HARNESS	CON-XXX (LOCK/EXIT TO HINGE FRAME)				VON
1	EA	WIRE HARNESS	CON-XXP (FRAME TO POWER SUPPLY)				VON
1	EA	DOOR CONTACT	679-05HM			BLK	SCE
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				

1. DURING SPECIFIED HOURS:
2. DOOR CAN BE UNLOCKED BY ACCESS CONTROL SYSTEM.

1. DURING NON-SPECIFIED HOURS:
2. DOOR CLOSED AND LOCKED.
3. ENTRY BY PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS EXIT DEVICE LATCH BOLT ALLOWING ENTRY. KEY OVERRIDE AVAILABLE.

1. AT ALL TIMES:
2. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES.
3. UPON LOSS OF POWER, OR ACTIVATION OF FIRE ALARM SYSTEM, DOOR TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
4. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

Hardware Group No. GATE-01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	PANIC HARDWARE	LD-OUT-98-NL-WH			626	VON
1	EA	RIM CYLINDER	20-057 ICX			626	SCH
1	EA	PRIMUS CORE	20-740-XP			626	SCH
1	EA	ELECTRIC STRIKE	6300 FSE 12/24 VAC/VDC		✓	630	VON
1	EA	POWER SUPPLY	PROVIDED BY SECURITY INTEGRATOR				
1	EA	CARD READER	PROVIDED BY SECURITY INTEGRATOR				
1	EA	BALANCE OF HARDWARE	PROVIDED BY BY GATE SUPPLIER REFER TO SPECIFICATION SECTION 32 31 26.				

1. GATE NORMALLY CLOSED AND LOCKED.
2. ENTRY BY PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY RELEASE ELECTRIC STRIKE PERMITTING ENTRY. KEY OVERRIDE AVAILABLE.
3. FROM EGRESS SIDE, FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER, GATE TO REMAIN CLOSED AND LOCKED (FAIL SECURE).
4. CONDUIT, WIRING, POWER, AND ACCESS CONTROL SYSTEM INTERFACE AND REQUIREMENTS BY DIV 26/28.

END OF SECTION 087100

Legend:
↯ Electrified Opening

Door#	HwSet#
100 A↯	ALD-01
100 B↯	ALD-02
101 A	01
101 B	02
102 A	03
102 B↯	04
103	05
104↯	06
105↯	07
106	08
108	09
109	10
110↯	04
112↯	11
113	12
114	13
115	14
116 A↯	15
116 B↯	16
116 C	17
117↯	18
118↯	04
119	14
121	19
122	14
123	20
124	21
126↯	22
127	23
128 A↯	ALD-03
128 B	24
129↯	06
130 A↯	06
130 B↯	25
131	21
132	21
134	26
135	21
136	21
138↯	27
139↯	28
140	29
141↯	30

Door#	HwSet#
142	31
143↯	07
145 A↯	18
145 B↯	32
146 A	33
146 B	33
146 C↯	34
147↯	ALD-04
148	29
149 A	35
149 B↯	36
150	21
151	05
152	37
201↯	16
202	14
203	38
204	39
205	40
206	41
207	42
208	43
D144	44
GATE G4↯	GATE-01
GATE G5↯	GATE-01

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

E. ASTM C1036 - Standard Specification for Flat Glass.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

K. GANA (GM) - GANA Glazing Manual.

L. GANA (LGRM) - Laminated Glazing Reference Manual.

M. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.

N. NFRC 100 - Procedure for Determining Fenestration Product U-factors.

O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.03 SUBMITTALS

A. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

C. Selection Samples: Provide manufacturer's color charts for silicone spandrel coating and for decorative interlayer.

D. Samples: Provide 12 inch by 12 inch samples of Glass Types 3, 4, and 6. Physical samples shall be of the complete glazing IGU assembly.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (LGRM), and IGMA TM-3000 for fabrication methods and glazing installation methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instructions. Deliver and store in a manner to prevent exposure to weather/moisture, direct sun/UV, and temperature changes.

1.06 FIELD CONDITIONS

A. Ambient Conditions: Do not install glazing, gasketing, or liquid sealants under adverse weather conditions, or when temperatures are above or below manufacturer's recommended limitations for sealant installation.

1. Do not install glazing when ambient temperature is less than 40 degrees F.
2. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:

1. Cardinal Glass Industries.
2. Guardian Glass, LLC.
3. Viracon.
4. Vitro Architectural Glass (formerly PPG Glass).

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.

1. Design Pressure: Calculated in accordance with ASCE 7 and values indicated on Structural Drawings.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
4. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide complete assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and air barrier.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   3. Provide Type I, Quality-Q3, Class 1 (clear) glazing unless otherwise indicated.
      a. Tinted Glazing: Where tinted glazing is indicated, provide Class 2 (tinted).
   4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   5. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
   6. Spandrel Glass Type: ASTM C1048, Type I, Condition - B, Quality - Q3, glass coated with opacifying coating indicated; with performance characteristics matching those of adjacent non-spandrel units. Coating shall be water-based silicone; ceramic frit is not acceptable.
   7. Low-Iron (Ultraclear) Glass: ASTM C1048, Type I, Class I, Quality - Q3.
      a. Products:
         1) Cardinal; Purevision.
         2) Guardian; UltraClear.
         3) Pilkington; Optiwhite.
         4) Vitro; Starphire.
   8. Decorative Glass (Solid-Color Interlayer): ASTM C1172, laminated glass with decorative interlayer.
      a. Manufacturers:
         1) Bendheim.
         2) GGI - General Glass International.
         3) Goldray Industries, Inc.
         4) M3 Glass Technologies.
         5) McGrory Glass.
         6) Substitutions: See Section 016000 - Product Requirements.
      b. Interlayer Color: Color shall be selected by Architect to match spandrel glass color.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172. Laminated glass shall be free of foreign substances and air or glass pockets.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class A or 16 CFR 1201 - Category II impact test requirements.
   2. Polyvinyl Butyral (PVB) Interlayer: 0.060 inch thick, minimum - decorative type with solid-color; refer to "Decorative Glass" in paragraph above.

2.04 INSULATING GLASS UNITS

A. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

B. Insulating Glass Units: Types as indicated. IGU's shall be pre-assembled in factory of multiple lites, with dehydrated interspace.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Warm-Edge Spacers: Manufacturer's warm-edge technology design.
      a. Spacer Width: As required for specified insulating glass unit.
      b. Spacer Height: Manufacturer's standard.
      c. Products:
         1) H.B. Fuller Construction Products Inc; Kodispace 4SG.
         2) Quanex IG Systems, Inc; Super Spacer TriSeal.
         3) Technoform Glass Insulation; TGI-Spacer.
         4) Substitutions: See Section 016000 - Product Requirements.
   4. Spacer Color: Black.
   5. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
      b. Color: Black.
   6. Purge interpane space with dry air, hermetically sealed.

2.05 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option I. Continuous by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.07 GLAZING SCHEDULE

A. Glazing Type 1 - Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Fully tempered float glass. Provide with safety glazing labeling.
   3. Tint: Clear.

4. Thickness: 1/4-inch, nominal.
5. Glazing Method: Dry glazing method, gasket glazing.

B. Glazing Type 2 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing except where otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
a. Tint: Gray.
b. Coating: Low-E (passive type), on #2 surface.
c. Coating Products (Low-E; Gray Tinted):
1) Cardinal; ES 25 Pure Grey #2.
2) Guardian; SN 68 Gray.
3) Viracon; #VE3-2M.
4) Vitro; Solarban 60 (2) Solargray.
4. Warm-edge spacer.
5. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
a. Tint: Clear.
6. Total Thickness: 1 inch.
7. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.30, maximum.
8. Solar Heat Gain Coefficient (SHGC): 0.25, maximum.
9. Glazing Method: Dry glazing method, gasket glazing.
10. Provide with safety glazing labeling.

C. Glazing Type 3 and 4 - Insulating Glass Units - Spandrel Glass.
1. Applications: Exterior glazing where indicated.
2. Space between lites filled with air.
3. Outboard Lite: Fully tempered low-iron float glass, 1/4 inch thick, minimum.
a. Tint: Clear.
b. Coating: Low-E (passive type), on #2 surface.
c. Coating Products (Clear; Low-E):
1) AGC; Energy Select 28.
2) Cardinal; ES 28 #2.
3) Guardian; SNX 62/27.
4) Viracon; #VNE 1-63.
5) Vitro; Solarban 70.
4. Warm-edge spacer.
5. Inboard Lite: Fully tempered low-iron float glass, 1/4 inch thick.
a. Tint: Clear.
b. Opacifier: Water-based silicone coating, on #4 surface. Ceramic frit is not acceptable.
c. Opacifier Color: Selected by Architect from manufacturer's full range.
6. Total Thickness: 1 inch.
7. Thermal (U-Value and SHGC): Match requirements of vision units.
8. Glazing Method: Dry glazing method, gasket glazing.
9. Provide with safety glazing labeling.

D. Glazing Type 5 - Bullet-Resistance-Rated Glazing - Refer to Division 8 Section "Security Windows."

E. Glazing Type 6 - Insulated Glazing Unit with Laminated Interior Lite with Decorative Interlayer:
   1. Applications: Exterior glazing where indicated.
   2. Space between lites filled with air.
   3. Outboard Lite: Fully tempered low-iron float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
      b. Coating: Low-E (passive type), on #2 surface.
      c. Coating Products (Clear; Low-E):
         1) AGC; Energy Select 28.
         2) Cardinal; ES 28 #2.
         3) Guardian; SNX 62/27.
         4) Viracon; #VNE 1-63.
         5) Vitro; Solarban 70.
   4. Warm-edge spacer.
   5. Inboard Lite: Laminated, 3/8 inch nominal; consisting of two 4 mm lites and decorative interlayer.
      a. Interlayer Color: To be selected by Architect from manufacturer's full range.
   6. Total Thickness: 1- to 1-1/8 inch per fabricator.
   7. Thermal (U-Value and SHGC): Match requirements of vision units.
   8. Glazing Method: Dry glazing method, gasket glazing.
   9. Provide with safety glazing labeling.

END OF SECTION 088000

SECTION 092216
COLD FORMED STEEL FRAMING - NON-STRUCTURAL (CFSF-NS)

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Refer to Section 054000 - Cold-Formed Steel Framing - Structural (CFSF-S): Requirements for structural, load-bearing, metal stud framing and overhead/suspended/bulkhead framing.

1.02 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

1.03 SUBMITTALS

A. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: AISI S220; sheet steel, of size and properties necessary for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.

1. Steel Thickness (Studs and Runners): Minimum 0.0179-inch (18 mil / 25 gauge) unless otherwise required to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf, and as indicated below:
    a. Provide minimum 0.0329-inch thickness (33 mil / 20 gauge) for all partitions using 3-5/8-inch-deep studs where stud partition height is greater than 12 feet above floor level.
    b. Provide minimum 0.0329-inch (33 mil / 20 gauge - Structural) for high-density board applications, such as ASTM C1178 tile backing panels and ASTM C1629 abuse- or impact-resistant gypsum board, and at door frames.
    c. Provide minimum 0.0329-inch (33 mil / 20 gauge - Structural) for walls receiving heavy wall-hung items or loads, including but not limited to wall cabinets, wall-hung countertops, TV brackets, liquid tanks, folding and fixed seats, grab bars, handrails, exercise equipment, and shelving greater than 9 inches deep and over 3 feet in length.
2. Studs: C-shaped with flat faces.
3. Runners: U-shaped, sized to match studs.

4. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
    a. Minimum Steel Thickness: Provide minimum 0.0329-inch (33 mil / 20 gauge - Structural) for all shaft wall stud applications.
    b. Studs: C-T shaped shaft wall stud profile.
    c. Runners and Jamb Struts: J-shaped with tabs, sized to match studs.
5. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
6. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.

B. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.

C. Non-Loadbearing Framing Accessories:
1. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
    a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
2. Bracing and Bridging: ASTM A653/A653M G90 galvanized steel; cold-rolled channel / hat-section profile; for lateral bracing of wall studs with slots for engaging on-module studs.
3. Framing Connectors: ASTM A653/A653M steel clips; secures cold rolled channel to wall studs for lateral bracing.
4. Sheet Metal Backing: 0.036 inch thick flat strap/plate.
5. Fasteners: Self-tapping screws designed for attachment of metal framing and recommended by manufacturer.
6. Anchorage Devices: Powder actuated or screw anchors with sleeves, recommended by manufacturer for anchorage to indicated substrates.
7. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced. Thickness as indicated, or sized to fit stud depth indicated.
8. Acoustic Sealant: Refer to Division 07 Section "Joint Sealants."

D. Isolation Strips: Provide either closed-cell foam tape with rubberized adhesive membrane or asphalt-saturated organic felt (ASTM D226, Type I, No. 15).

2.02 GYPSUM BOARD SUSPENSION SYSTEM

A. For interior overhead gypsum board, in lieu of separate stick built fixed-framing bulkheads and soffits fabricated of Structural Cold-Formed Steel Framing (CFSF-S), Contractor may provide a direct hung suspension system, per ASTM C645, composed of pre-fabricated beams and cross-furring members, specifically designed for use with gypsum board.

B. Products:
1. Armstrong; Quikstix Drywall Grid System.
2. Certainteed; 1-1/2" Drywall Suspension System.
3. Rockfon; Chicago Metallic Drywall Grid System.
4. USG; Drywall Suspension System.

2.03 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

A. Install in accordance with ASTM C754. Provide framing, including bracing, bridging, and anchorage accessories, to meet L/240 deflection limit at a lateral pressure of 5 psf unless indicated otherwise.

1. Gypsum Board: At gypsum board partitions and assemblies, comply with applicable requirements of ASTM C840 for framing installation.
2. Install a continuous isolation strip where studs or stud-framed partitions directly abut dissimilar metals or exterior masonry wall.

B. Extend partition framing to deck at locations indicated, and to a height 4 inches above ceiling level at all other locations, unless otherwise indicated.

C. Partitions Terminating to Deck: Secure partitions to building structure in accordance with Structural Drawings. Do not fasten runner directly to floor/roof deck; provide clearance for firestopping. Coordinate with Section 078400 - Firestopping for head-of-wall joint firestopping assemblies and firestopping around structural elements as required.

D. Partitions Terminating Above Ceiling: Attach studs to runner using specified mechanical devices in accordance with manufacturer's instructions. Brace runners to structural elements in accordance with Structural Drawings.

E. Align and secure top and bottom runners at maximum 24 inches on center.

F. At partitions indicated with an acoustic rating:

1. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.

G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

H. Install studs vertically at 16 inches on center, unless otherwise indicated.

I. Align stud web openings horizontally.

J. Secure studs to tracks using crimping method. Do not weld.

K. Fabricate corners using a minimum of three studs.

L. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.

M. Install bracing, bridging, and anchorage to brace stud framing system rigid.

N. Coordinate erection of studs with requirements of door frames; install supports and attachments.

O. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

P. Blocking: Use FRT wood blocking or metal channel stud blocking, secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, opening frames, and other built-in-place wall mounted items and equipment.

Q. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

3.03 GYPSUM BOARD SUSPENSION SYSTEM

A. Install suspension system in accordance with manufacturer's instructions. Do not attach overhead suspension hangers to or suspend from steel floor or roof deck; fasten to primary structural beams/joists or provide intermediate slotted track as supplemental structure between primary structural elements.

3.04 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION 092216

SECTION 092900
GYPSUM BOARD

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.

C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

H. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units.

I. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

J. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

K. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.

L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

M. GA-216 - Application and Finishing of Gypsum Panel Products.

N. UL 752 - Standard for Bullet-Resisting Equipment.

1.02 SUBMITTALS

A. Product Data:
   1. Provide data on gypsum board, accessories, and joint finishing system.

B. Ballistic Test Reports: Indicate compliance of bullet-resistant sheathing and wallboard assemblies with specified requirements.

1.03 DELIVERY, STORAGE, HANDLING, AND FIELD CONDITIONS

A. Do not deliver or install until building is weather-tight and conditioned.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent damage and to prevent marring and soiling of finished surfaces.

C. Do not install gypsum products that have gotten wet or moldy, or show signs of past moisture damage.

D. Maintain uniform temperature and humidity at occupancy conditions during and after installation. Allow products to acclimatize prior to installation.

PART 2 PRODUCTS

2.01 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; with tapered edges.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold-resistant board is required whenever gypsum board is indicated in rooms subject to steam or water, including mechanical rooms, toilet rooms, custodial rooms, and kitchens.
   3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Curved Surfaces: Provide flexible 1/4 inch thickness gypsum board, installed in two layers.

B. Impact Resistant Wallboard:
   1. Application: High-traffic areas indicated.
   2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   5. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
   6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   7. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
   8. Glass Mat-Faced Type: Gypsum wallboard, as defined in ASTM C1658/C1658M.
   9. Type: Fire-resistance-rated Type X, UL or WH listed.
   10. Thickness: 5/8 inch.
   11. Edges: Tapered.
   12. Paper-Faced Products:
      a. American Gypsum Company; M-Bloc IR Type X.
      b. CertainTeed Corporation; Extreme Impact Resistant Drywall with M2Tech.
      c. National Gypsum Company; Gold Bond Hi-Impact XP Gypsum Board.
      d. Substitutions: See Section 016000 - Product Requirements.
   13. Glass Mat Faced Products:
      a. Georgia-Pacific Gypsum; DensArmor Plus Impact-Resistant.
      b. USG Corporation; USG Sheetrock Brand Glass-Mat Panels Mold Tough VHI.
      c. Substitutions: See Section 016000 - Product Requirements.

C. Tile Backing Board:
   1. Application: Surfaces behind tile in wet areas including tub and shower surrounds.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. ANSI Cement-Based Board: Non-gypsum-based; cementitious panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 and ASTM C 1288 or ASTM C1325.
    a. Thickness: 5/8 inch.
    b. Available Products:
        1) FinPan, Inc.; Util-A-Crete Backer Board.
        2) National Gypsum Company; PermaBase Cement Board.
        3) USG Corporation; Durock Cement Board.
        4) Substitutions: See Section 016000 - Product Requirements.

D. Bullet Resistant Sheathing and Wallboard: Woven roving, multi-ply, ballistic grade fiberglass cloth with thermoset polyester resin; comply with UL 752 Level 3. Size boards to minimize joints.
    1. Thickness: Nominal 7/16 inch or 1/2 inch as standard with manufacturer.
    2. Available Products:
        a. ArmorCore by Waco Composites; Bullet Resistant Fiberglass Panels.
        b. Armortex, Div. of Safeguard Security System, Inc.; OF 300.
        c. Chicago Bullet Proof Systems; Fibre-Tex.
        d. C.R. Laurence of North America; BRF300.
        e. Insulgard Corporation; FG-300.

2.02 GYPSUM BOARD ACCESSORIES

A. Sound Attenuation Batts: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness sized to fit metal stud cavity.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant. Refer to sealant AS-1 in Division 07 Section "Joint Sealants."

C. Putty Pads: Non-hardening endothermic material, in pad form, faced on both sides with poly liner, designed to seal around penetrations and wiring devices, enhancing acoustic performance.
    1. Nominal Size: 7-1/4 x 7-1/4 x 3/16 inches.
    2. Available Products:
        a. 3M; Fire Barrier Moldable Putty Pads MPP+.
        b. Hilti; Firestop Putty Pad, CFS-P PA.
        c. Specified Technologies, Inc.; SpecSeal Putty Pad.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
    1. Corner Beads: Low profile, for 90 degree outside corners.
    2. L-Bead, LC-Bead, and U-Bead: Sized to fit gypsum wallboard size(s) indicated.
        a. Provide LC-bead at exposed panel edges and U-bead at concealed panel edges, unless otherwise indicated. Provide L-bead at locations indicated.

E. Decorative Metal Trim:
    1. Material: Extruded aluminum alloy 6063-T5 temper.
    2. Finish: Anodized, clear.
    3. Reveal Trim: Provide 1/2-inch wide by either 1/2-inch or 5/8-inch deep, as standard with manufacturer.
        a. Products:

1) Fry Reglet; Model DRM-625-50.
2) Flannery, Inc; Model DWR 625-50.
3) Gordon, Inc; Part # 512-5/8.
4) Pittcon Industries; Model SWR-050-063.
5) Tamlyn; Model RV5-12.

4. "F" Reveal Molding: 1/2-inch wide by 5/8-inch deep with 7/8-inch flange on one side only for reveals where drywall terminates against jamb, ceiling, or other finish material.
   a. Products:
      1) Fry Reglet; Model DRMF-625-50.
      2) Flannery, Inc; Model DWRF 625-50.
      3) Gordon, Inc; Part # 412-5/8.
      4) Pittcon Industries; Model SWR-050U-063.
      5) Tamlyn; Model MCR5-12
5. L-Trim Molding: "L" angle molding where drywall raised panel terminates at other substrates.
   a. Products:
      1) Fry Reglet: Model DRML-625.
      2) Flannery, Inc; Model DWL 625.
      3) Gordon, Inc; Part # 258.
      4) Pittcon Industries; Model ST-063.
      5) Tamlyn; Model MLR-58.
6. Stepped Outside Corner: Exposed metal reveal profile for 90 degree outside corners.
   a. Products:
      1) Fry Reglet: Model DRMW 625-625.
      2) Flannery, Inc; Model DWRW 625-625.
      3) Gordon, Inc; Part # 945-2X-58.
      4) Pittcon Industries; Model SCS-2X 063-063.
      5) Tamlyn; (no product - provide custom to match profiles above).

F. Acoustic Partition Closure at Storefront or Curtain Wall: Multi-piece rectangular-section assembly of nested U-shape aluminum extrusions for finished closure between aluminum storefront or curtainwall system vertical mullion (and glass where indicated), and partition assembly. Closure shall allow for movements of framing and glass it attaches to, and shall not allow direct metal to glass contact. Fill cavity of partition closure with acoustic batt insulation.
   1. Thickness: Aluminum closure plates not less than 0.125-inch thick.
   2. Acoustic Rating: Provide product with a minimum tested STC rating of 55.
      a. Acoustic Material: Fungi- and microbe-resistant foam, Class A rated when tester per ASTM E 84.
   3. Acoustical Sealant: Seal both ends of partition closure with acoustical sealant.
   4. Finish: Powder coat; color selected by Architect from manufacturer's full range.
   5. Available Products:
      a. Gordon, Inc; Mullion Mate.
      b. Mull-It-Over Products; Mull-It-Over.

G. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

H. Security Barrier Mesh: ASTM F 1267, Type II, Class 1; expanded and flattened diamond mesh security barrier. Fabricate of uncoated, minimum 18 gage carbon steel, weight 0.66 lbs/sq. ft. Provide with lath mesh size approximately 1/2-inch by 1-1/4-inch.
   1. Mesh Fasteners: Provide fasteners that are non-corrosive to both mesh and framing substrate; as recommended by manufacturer for mesh-to-mesh and mesh-to-framing fastening.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Sound Attenuation Batts: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Security Gypsum Partitions and Ceilings: At security gypsum assemblies indicated, install expanded/flattened metal security barrier mesh followed by impact resistant gypsum board.

F. Install gypsum board with an open horizontal joint (gap) not to exceed 5/8-inch above finished floor slab, and tape and finish vertical joints to bottom edge of board to afford a smooth substrate for applied wall base.

G. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.

H. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

I. Bullet Resistant Sheathing and Wallboard:
   1. Install bullet-resistant sheathing according to manufacturer's written recommendations and with manufacturer-approved fasteners.
   2. Cover all joints between boards with a 4-inch strip of the same thickness material as the boards, centered on the joint.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints in compliance with ASTM C 840, consistent with lines of building spaces, and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

D. Putty Pads: Install putty pads on the backside of items penetrating gypsum board on STC-rated walls/partitions. Items include, but are not limited to, wiring devices, cable, conduit, and pipe. Completely cover and seal around each penetration.

3.05 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

C. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION 092900

SECTION 093000
TILING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.

B. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar.

C. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar.

D. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship.

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive.

F. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar.

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy.

H. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.

I. ANSI A108.10 - Installation of Grout in Tilework.

J. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.

K. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar.

L. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs.

M. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.

N. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

O. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.

Q. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

R. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

S. SCAQMD 1113 - Architectural Coatings.

T. SCAQMD 1168 - Adhesive and Sealant Applications.

U. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting at the Project Site one week before starting work of this section; require attendance by affected installers.
   1. Review substrate preparation requirements.
   2. Review each type of tile, mortar, grout, and TCNA installation methods.
   3. Review requirements for waterproofing and/or crack isolation membrane(s).

1.03 SUBMITTALS

A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
   1. Include waterproofing details at floor drains, shower pans, cove base, and thresholds.

C. Samples: Submit tile sample from manufacturer's full range for each type of tile.

D. Installer's Qualification Statement.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall have documented experience of work similar in scope, materials, and design to that indicated for this Project, with a record of successful in-service performance, with references upon request.

1.05 MOCK-UPS

A. See Section 014000 - Quality Requirements for general requirements for mock-up.

B. Construct tile mock-ups, incorporating all components specified for the location.
   1. Provide mock-up of minimum 5 square feet for each type of floor tile, unless otherwise indicated.
   2. Provide mock-up of minimum 5 square feet for each type of wall tile, unless otherwise indicated.
   3. Approved mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store tile, grout, and mortar off the ground, protected from weather and water infiltration.

B. Store products in unopened containers or packages until ready for use.

C. Protect materials from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature and humidity at levels required by referenced ANSI and TCNA tile standards, and per manufacturer's instructions.

PART 2 PRODUCTS

2.01 TILE

A. Source Limitations: Provide all products of each type by the same manufacturer.

B. Glazed Wall Tile **[GWT-1]**: ANSI A137.1 standard grade.
   1. Size: 4 by 12 inch, nominal; 5/16-inch thick.
   2. Edges: Cushioned.
   3. Surface Finish: High gloss.
   4. Color(s): To be selected by Architect from manufacturer's full range.
   5. Products:
      a. Mosaic Tile; Color Perspectives **(Basis of Design).**
      b. Trinity Tile; Hyde Park.
      c. Best Tile; Marea.

C. Glazed Wall Tile **[GWT-2]**: ANSI A137.1 standard grade.
   1. Size: 4 by 12 inch, nominal; 5/16-inch thick.
   2. Edges: Cushioned.
   3. Surface Finish: High gloss.
   4. Color(s): To be selected by Architect from manufacturer's full range.
   5. Products:
      a. Mosaic Tile; Color Perspectives **(Basis of Design)**.
      b. Trinity Tile; Hyde Park.
      c. Best Tile; Marea.

D. Porcelain Tile **[P-TILE]**: ANSI A137.1 standard grade.
   1. Size: 12 by 12 inch, nominal.
   2. Color(s): To be selected by Architect from manufacturer's full range.
   3. Trim Units: Matching cove base shapes in sizes coordinated with field tile.
   4. Products:
      a. Mosaic Tile; Argent 2.0 **(Basis of Design).**
      b. Trinity Tile; Cassa.

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Satin brass anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of wall tile.
      b. Open edges of floor tile.
      c. Wall corners, outside and inside.
      d. Transition between floor finishes of different heights.
      e. Thresholds at door openings.
      f. Expansion and control joints, floor and wall.
      g. Floor to wall joints.
      h. Borders and other trim as indicated on drawings.
   2. Manufacturers:
      a. Schluter-Systems.
      b. Genesis APS International.

c. Blanke.
d. Ceramic Tool Company (CTC).
e. Substitutions: See Section 016000 - Product Requirements.

B. Thresholds: 2 inches wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
1. Material: Marble, honed finish.
2. Color and Pattern: Thassos White M420.
3. Applications:
a. At doorways where tile terminates.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
1. Applications: Use this type at all locations where thinset mortar is indicated, unless otherwise indicated.
2. Products:
a. Custom Building Products; VersaBond Professional Thin-Set Mortar.
b. H.B. Fuller Construction Products, Inc.; TEC Full Flex TA 390/391.
c. LATICRETE International, Inc.; 252 Silver.
d. MAPEI Corporation; Ultraflex 2.
e. Summitville Tiles, Inc.; S-1000 MP Thin-Set Latex Mortar.
f. Substitutions: See Section 016000 - Product Requirements.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. High Performance Polymer Modified Grout **[GRT-1]**: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color(s): To be selected by Architect from manufacturer's full range.
4. Products:
a. MAPEI Corporation; Ultracolor Plus **(Basis of Design)**.
b. Custom Building Products; Prism Color Consistent Grout.
c. H.B. Fuller Construction Products, Inc; TEC AccuColor Plus Grout.
d. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout.
e. Merkrete, by Parex USA, Inc; Merkrete Pro Grout.

C. High Performance Polymer Modified Grout **[GRT-2]**: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout with **GWT-B**.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color(s): To be selected by Architect from manufacturer's full range.
4. Products:
a. MAPEI Corporation; Ultracolor Plus **(Basis of Design)**.
b. Custom Building Products; Prism Color Consistent Grout.

c. H.B. Fuller Construction Products, Inc; TEC AccuColor Plus Grout.
d. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout.
e. Merkrete, by Parex USA, Inc; Merkrete Pro Grout.

2.05 MAINTENANCE MATERIALS

A. Tile Sealants: Moisture- and mildew-resistant type sealants; one-part silicone for wall applications and multi-part urethane for floor applications. Sealants and accessories shall comply with requirements below and with requirements of Division 7 Section "Joint Sealants."
   1. Color(s): As selected by Architect from manufacturer's full line. Sealant colors shall match grout colors in adjacent joints unless otherwise indicated.
   2. Low-Emitting Materials:
      a. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.
   3. Silicone Sealant (Walls): ASTM C 920, Type S, Grade NS, Class 25; Uses NT (non-traffic), G (glass), A (aluminum), O (other substrates indicated).
      a. Products:
         1) GE Silicones, a division of GE Specialty Materials; SCS1700 Sanitary.
         2) Pecora Corporation; Pecora 898 NST.
         3) Tremco Inc.; Tremsil 200.
         4) Substitutions: See Section 016000 - Product Requirements.
   4. Urethane Sealant (Floors): ASTM C 920, Type M, Grade P, Class 25; Uses T (traffic), M (mortar), A (aluminum), O (other substrates indicated).
      a. Products:
         1) Master Builders Solutions; MasterSeal SL 2.
         2) Pecora Corporation; NR-200 Urexpan.
         3) Sika Corporation; Sikaflex-2c SL.
         4) Tremco Inc.; THC-901.
         5) Substitutions: See Section 016000 - Product Requirements.
   5. Sealant Accessories: Provide backer rod, primer, and other sealant accessories as recommended by sealant manufacturer for applications required.

B. Grout Sealer: Liquid-applied, penetrating, moisture and stain protection for existing or new Portland cement grout.
   1. Composition: Water-based colorless silicone.
   2. Products:
      a. Custom Building Products; Aqua Mix Sealer's Choice Gold.
      b. Merkrete, by Parex USA, Inc; Merkrete Grout Sealer.
      c. SGM, Inc.; Grout Sealer.
      d. Summitville Tiles, Inc.; SL-99 Summitseal II.
      e. Substitutions: See Section 016000 - Product Requirements.

C. Tile Sealer: Stain protection for exposed surfaces of unglazed ceramic tile, other porous tile, and grout. Provide penetrating sealer with no sheen, preserving natural tile appearance.
   1. Products:
      a. Custom Building Products; Aqua Mix Sealer's Choice Gold.
      b. Rust-Oleum Corporation; Miracle Sealants 511 Impregnator Natural Looking Penetrating Sealer.

c. STONETECH, a division of LATICRETE international, Inc; STONETECH Heavy Duty Sealer.
d. Substitutions: See Section 016000 - Product Requirements.

D. Grout Release: Temporary, water-soluble pre-grout coating.
1. Products:
a. Custom Building Products; Aqua Mix Grout Release.
b. MAPEI Corporation; UltraCare Grout Release.
c. Substitutions: See Section 016000 - Product Requirements.

2.06 ACCESSORY MATERIALS

A. Low-Emitting Materials:
1. Paints and Coatings: Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.
2. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

B. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch gap, minimum.
2. Peel-and-Stick Sheet Type:
a. Material: Rubberized membrane laminated to reinforcing fabric.
b. Thickness: 40 mils, nominal.
c. Products:
1) Boiardi Products Corp.; a QEP company; Elastiment 340 Sound Control Sheet Membrane Waterproofing and Anti-Fracture/Crack-Suppression System.
2) Custom Building Products; Crack Buster Pro-Crack Prevention Mat Underlayment.
3) MAPEI Corporation; Mapeguard 2.
4) National Applied Construction Products, Inc.; ECB Anti-Fracture Membrane.
5) Substitutions: See Section 016000 - Product Requirements.

C. Waterproofing Membrane: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Crack Resistance: No failure at 1/8 inch gap, minimum; comply with ANSI A118.12.
2. Fluid or Trowel Applied Type with Embedded Reinforcing Fabric:
a. Material: Synthetic rubber or Acrylic.
b. Thickness: 30 mils, minimum, dry film thickness.
c. Products:
1) Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
2) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane.
3) LATICRETE International, Inc; 9235 Waterproofing Membrane.
4) MAPEI Corporation; Mapelastic AquaDefense.
5) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 2000.
6) Summitville Tiles, Inc.; S-9000.
7) Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work, per ANSI A108.01, and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. For ease of cleaning and to prevent staining, precoat tile with temporary grout release. For unglazed ceramic and other porous tile types, provide either combination tile sealer/grout release, or a temporary grout release with final tile sealer applied after tile installation.

3.03 INSTALLATION - GENERAL

A. Mortar Types: Provide modified dry-set mortar in a standard thin-set bed except as indicated:
   1. Provide LHT mortar in a 1/4- to 3/8-inch medium bed at all large format tile (tile 12 inches or greater in any dimension).

B. Grout Types: Grout all tile joints unless otherwise indicated. Provide high-performance polymer-modified grout except as indicated:
   1. Provide epoxy grout in toilet, shower, and locker rooms, custodial/janitorial rooms, and other spaces subject to water.

C. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

D. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

E. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

F. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

G. Form internal angles square and external angles bullnosed.

H. Install non-ceramic trim in accordance with manufacturer's instructions.

I. Install thresholds where indicated.

J. Sound tile after setting. Replace hollow sounding units.

K. Keep control and expansion joints free of mortar, grout, and adhesive.

L. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over new interior concrete substrates, install in accordance with TCNA (HB) Method F122/F122A, over combination waterproofing/crack-isolation membrane.

B. Over existing interior concrete substrates on grade, install in accordance with TCNA (HB) Method F125-Full, over full coverage crack-isolation membrane.

C. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION METHODS - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

B. Over interior concrete / masonry install in accordance with TCNA (HB) Method W202.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 093000

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.

G. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.02 SUBMITTALS

A. Shop Drawings: Indicate grid layout and related dimensioning.

B. Product Data: Provide data on suspension system components, acoustical units, and specialty ceiling products as indicated.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Refer to Section 016000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Panels: Quantity equal to 2 percent of total installed, of each type.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

A. Source Limitations: Provide each acoustical ceiling assembly (ceiling panel and suspension system) from a single manufacturer to obtain manufacturer's system warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver until building is weather-tight and conditioned.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent damage and to prevent marring and soiling of finished surfaces.

1.05 FIELD CONDITIONS

A. Maintain uniform temperature and humidity at occupancy conditions during and after acoustical unit installation. Allow products to acclimatize prior to installation.

1.06 WARRANTY

A. System Warranty: Provide a single source system warranty covering both acoustical ceiling panels and suspension system.
   1. Warranty shall cover material failures including sag, warping, shrinkage, or delamination, biologic growth including mold or mildew, and rusting of suspension system.

2. Warranty Period: Minimum 15 years, from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Each acoustical ceiling shall be Class A rated, with flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E84.

B. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7, which references applicable requirements of ASTM E580/E580M "Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions." for Seismic Design Category indicated on Structural Drawings and complying with local authorities having jurisdiction.

2.02 ACOUSTICAL PANELS

A. Acoustical Panels - General: ASTM E1264, Class A.
   1. VOC Content: Third-party tested and certified, according to California Department of Public Health (CDPH) Standard Method (CA Section 01350).
   2. Antibacterial/Antimicrobial Treatment: Provide acoustical panels that have been factory-treated by manufacturer for resistance to bacteria, mold, mildew, and fungus.
   3. Humidity/Sag Treatment: Provide acoustical panels that have been factory-treated by manufacturer for humidity and sag-resistance.

B. Acoustical Panels **ACP-A:** Mineral fiber with membrane-faced overlay, with the following characteristics:
   1. Classification: ASTM E1264, Type A - Mineral Base.
      a. Form: A2.2 - With membrane-faced overlay, wet formed.
      b. Pattern: "E" - lightly textured.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: Not less than 0.88, determined in accordance with ASTM E1264.
   5. NRC Range: Not less than 0.75, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): Not less than 35, determined in accordance with ASTM E1264.
   7. Panel Edge: Square.
   8. Color: White.
   9. Suspension System: Exposed grid.
   10. Products:
      a. Armstrong World Industries, Inc; Ultima - Item #1910 **(Basis of Design).**
      b. CertainTeed Ceilings, Inc.; Symphony m - Item #1222-75-1.
      c. USG Corporation; Mars Acoustical Panels - Item #86185.

C. Acoustical Panels **ACP-B:** With the following characteristics:
   1. Classification: ASTM E1264, Type B - Glass fiber with membrane overlay.
      a. Form: B2 - Cloth.
         1) Pattern: "E" - lightly textured.
      b. Size: 24 by 24 inches.
   2. Thickness: 1 inch.
   3. Light Reflectance: Not less than 0.86, determined in accordance with ASTM E1264.

4. NRC Range: Not less than 0.95, determined in accordance with ASTM E1264.
5. Panel Edge: Square.
6. Color: White.
7. Suspension System: Exposed.
8. Products:
    a. Armstrong World Industries, Inc; Optima Healthzone PB - Item #3114PB **(Basis of Design).**
    b. CertainTeed Ceilings, Inc; Symphony f Rx - Item #1342-RXS-1.
    c. USG Corporation; Halcyon ECO Acoustical Panels - Item #97312.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
    1. Materials:
        a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
    2. Cross Tee/Main Runner Connection: Override (stepped).
    3. Main Runner End Coupling: Bayonet ("stab") type; knuckle type is not acceptable.

B. Exposed Suspension System, **[ACP-A and ACB-B]**: Hot-dipped galvanized steel grid and cap.
    1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
    2. Profile: Tee; 15/16 inch face width.
    3. Finish: Baked enamel.
    4. Products:
        a. Armstrong World Industries, Inc; Prelude XL 15/16" **(Basis of Design).**
        b. CertainTeed Ceilings, Inc; 15/16" EZ Stab Classic System.
        c. USG Corporation; Donn Brand DX/DXL 15/16 inch Acoustical Suspension System.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.
    1. Acoustical Sealant For Perimeter Moldings: Refer to Section 079200 - Joint Sealants for acoustical sealant for use in conjunction with suspended ceiling system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Apply acoustical sealant in a continuous bead at top edge of vertical legs of moldings after they are installed.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
   1. Do not hang suspension system directly from steel floor or roof deck.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

F. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 095100

SECTION 096513
RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.

D. ASTM F1861 - Standard Specification for Resilient Wall Base.

E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

F. ASTM F2169 - Standard Specification for Resilient Stair Treads.

G. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

H. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.02 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

C. Verification Samples: Submit in manufacturer's standard size, illustrating color and pattern for each resilient flooring product specified.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

C. Protect roll materials from damage by storing on end.

1.04 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

B. Maintain conditions at occupancy conditions for installation and until Substantial Completion.

PART 2 PRODUCTS

2.01 RESILIENT BASE

A. Resilient Base **[RB-A]**: ASTM F1861, Type TP, rubber, thermoplastic; Style B, Cove.
   1. Products (Type TP):
      a. Nora Systems, Inc; Nora Wall Base; Article 820 **[Basis of Design].**
      b. Armstrong World Industries, Inc.; Rubber Coved Toe Wall Base.

c. Flexco (USA), Inc.; Flexco Base 2000 - Cove.
d. Johnsonite, a Tarkett Company; Rubber Wall Base - Cove.
e. Mannington Commercial; Burkebase Type TP - Coved.
f. Roppe Corporation; 700 Series TPR Wall Base - Style B (Coved).

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
3. Height: 4 inch.
4. Thickness: 0.125 inch minimum.
5. Finish: Satin.
6. Length: Roll; manufacturer's standard length.
7. Color: To be selected by Architect from manufacturer's full range.

B. Resilient Base **[RB-B]** ASTM F1861, Type TP, rubber, thermoplastic; Style B, Cove.
1. Products (Type TP):
a. Nora Systems, Inc; Nora Wall Base; Article 820 **[Basis of Design].**
b. Armstrong World Industries, Inc.; Rubber Coved Toe Wall Base.
c. Flexco (USA), Inc.; Flexco Base 2000 - Cove.
d. Johnsonite, a Tarkett Company; Rubber Wall Base - Cove.
e. Mannington Commercial; Burkebase Type TP - Coved.
f. Nora Systems, Inc; nora wall base; Article 820.
g. Roppe Corporation; 700 Series TPR Wall Base - Style B (Coved).
h. Substitutions: See Section 016000 - Product Requirements.
2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
3. Height: 6 inch.
4. Thickness: 0.125 inch minimum.
5. Finish: Satin.
6. Length: Roll; manufacturer's standard length.
7. Color: To be selected by Architect from manufacturer's full range.

2.02 STAIR COVERING

A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness.
1. Manufacturers:
a. Nora Rubber Flooring **[Basis of Design].**
b. Flexco, Inc.
c. Johnsonite, a Tarkett Company.
d. Mannington Commercial.
e. Roppe Corporation.
2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
4. Nominal Thickness: 0.250 inch, tapered towards rear.
5. Nosing: Square, adjustable; 1-1/2 inch height.
6. Striping: 2 inch wide contrasting color abrasive strips.
7. Texture: Raised, with pattern selected from manufacturer's full range.

8. Color: To be selected by Architect from manufacturer's full range.

B. Stair Risers: Full height and width of tread in one piece, matching treads in material and color.
   1. Manufacturer: Provide risers by same manufacturer as treads.
   2. Thickness: 0.125 inch.

2.03 MOLDINGS, TRANSITIONS, AND EDGE STRIPS

A. Moldings, Transition and Edge Strips:
   1. Manufacturers:
      a. Flexco, Inc.
      b. Johnsonite.
      c. Mannington Commercial.
      d. R.C.A. Rubber Company (The).
      e. Roppe Corporation.
      f. VPI, LLC; Floor Products Division.
   2. Molding/Transition Strip Profiles: Provide in sizes as required to suit flooring thicknesses and applications.
      a. Coved edge/cap for carpet.
      b. Joiner between carpet and resilient flooring or other materials with different heights.
      c. Transition strip between different types of materials that are the same height or between different styles/patterns of the same material.
      d. Slim transition strip with approximately 1/4-inch wide visible transition profile.
      e. Reducer strip at edges of flooring to reduce height to 0".
      f. Subfloor leveling accessory to transition between materials with height differences up to 1/2 inch.
   3. Material: Manufacturer's standard rubber or vinyl.
   4. Color: To be selected by Architect from manufacturer's full range.

2.04 ACCESSORIES

A. Leveling Compound: Blended cement mix, latex-modified, for use as trowelable underlayment, approved by resilient accessory manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Moisture Vapor Treatment: Where resilient flooring and accessories are installed over concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:
   1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
      a. Duraamen Engineered Products, Inc.; Perdure MVT.
      b. Maxxon Corporation; Maxxon MVP.
      c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
   2. Performance Requirements:
      a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer’s warranty.
      b. Low-VOC: Provide product with VOC content less than 15 g/L.
      c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).

d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft^2/in-Hg, per ASTM F3010.
e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

D. Floor Polish: Fluid-applied polish recommended by resilient flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
1. Do not apply wall base until other finish items, including casework and painting, are complete.

C. Cementitious Subfloor Surfaces (Stair Treads/Landings): Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Test as Follows: Perform one of each test in each installation area (each stair).
a. Alkalinity (pH): ASTM F710, when required by stair accessory manufacturer.
b. Internal Relative Humidity: ASTM F2170. One test per stair area.
c. Moisture Vapor Emission: ASTM F1869. One test per stair area.
2. If test results are not within limits recommended by stair accessory manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with leveling compound to achieve smooth, flat, hard surface.

C. Prohibit traffic until leveling compound is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
1. Fit joints and butt seams tightly.
2. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, install such that molding profiles or transition strips are centered under the door panel.

E. Install edge/reducer strips at unprotected or exposed edges, where flooring terminates, and where indicated.
1. Resilient Strips: Attach to substrate using adhesive.

3.04 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

C. Job form internal and external corners in accordance with manufacturer's instructions. Form corners by "V" cutting or scribing; do not bend material in a manner that creates stress whitening.

D. In addition to walls, install base on other permanent construction with exposed vertical faces at floor level, including, but not limited to, columns, pilasters, and casework/cabinet knee and toe spaces.

E. Scribe and fit to door frames and other interruptions.

F. At uneven substrate surfaces (such as masonry mortar joints), provide manufacturer's recommended filler sealant or adhesive to fill voids along top of base.

3.05 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Install stringers configured tightly to stair profile.

C. Adhere over entire surface. Fit accurately and securely.

D. Clean stair tread and landing accessories and apply floor polish according to manufacturer's written instructions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient accessories for 48 hours after installation.

B. Cover resilient accessories and protect from heavy construction traffic and equipment until Substantial Completion.

END OF SECTION 096513

SECTION 096516
RESILIENT SHEET FLOORING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.02 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Shop Drawings: Indicate seaming plans, floor patterns, and dye lot.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.04 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide a ten (10) year manufacturer warranty, covering defective material and installation.

C. Installer's Warranty: Installer shall warrant that the products have been installed in accordance with manufacturer's instructions.

1. The installer shall provide a ten (10) year warranty against product failure due to excessive moisture vapor transmission through the slab.

PART 2 PRODUCTS

2.01 SHEET FLOORING

A. Vinyl Sheet Flooring **[RSF]**: Transparent or translucent vinyl wear layer over interlayer and backing.

1. Manufacturers:
   a. Gerflor USA, Inc; Taraflex Sport M Plus **(Basis of Design).**
   b. Ecore Internatinal, Inc.; Forest Rx.

c. Tarkett Sports; Omnisports Active+.

2. Minimum Requirements: Comply with ASTM F1303, Type I, with Class A fibrous backing.
3. Wear Layer Thickness: 0.7 inch (2mm) minimum.
4. Total Thickness: 0.2 inch (7mm) minimum.
5. Seams: Heat welded.
6. Color: To be selected by Architect from manufacturer's full range.

B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.02 ACCESSORIES

A. Subfloor Filler: Type recommended by adhesive material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Moisture Vapor Treatment: Where resilient flooring and accessories are installed over concrete slabs, and where field testing indicates high moisture vapor testing through concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab in accordance with Division 01 MVT allowance and unit price, and per the following:

1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
   a. Duraamen Engineered Products, Inc.; Perdure MVT.
   b. Maxxon Corporation; Maxxon MVP.
   c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
2. Performance Requirements:
   a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer’s warranty.
   b. Low-VOC: Provide product with VOC content less than 15 g/L.
   c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
   d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft^2/in-Hg, per ASTM F3010.
   e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

D. Floor Polish: Fluid-applied polish recommended by resilient flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).

1. Test as Follows: Perform a minimum of one of each test per 1,000 sf of installation area.
   a. Alkalinity (pH): ASTM F710.
   b. Internal Relative Humidity: ASTM F2170.
   c. Moisture Vapor Emission: ASTM F1869.

2. If test results are not within limits recommended by flooring manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. **Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.**

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Fit joints and butt seams tightly.
   2. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

B. Seams are prohibited in bathrooms, kitchens, toilet rooms, and custodial closets.

3.05 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

C. Polish: Apply not less than three coats of floor polish. Provide additional coats as required to comply with manufacturer's recommendations.

3.06 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 096516

SECTION 096536
STATIC-CONTROL RESILIENT FLOORING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AATCC Test Method 134 - Test Method for Electrostatic Propensity of Carpets.

B. ANSI/ESD STM7.1 - The Protection of Electrostatic Discharge Susceptible Items Flooring Systems Resistive Characterization.

C. ANSI/ESD STM97.1 - ESD Association Standard Test Method for the Protection of Electrostatic Discharge Items - Floor Materials And Footwear - Resistance Measurement in Combination with a Person.

D. ANSI/ESD STM97.2 - Floor Materials and Footwear - Voltage Measurement in Combination with a Person.

E. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

F. ASTM F150 - Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring.

G. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

H. ASTM F1344 - Standard Specification for Rubber Floor Tile.

I. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

J. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

K. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.02 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Shop Drawings: Indicate seaming plans, floor patterns, and dye lot.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.04 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide a ten (10) year manufacturer warranty, covering defective material and installation.

C. Installer's Warranty: Installer shall warrant that the products have been installed in accordance with manufacturer's instructions.
   1. The installer shall provide a ten (10) year warranty against product failure due to excessive moisture vapor transmission through the slab.

PART 2 PRODUCTS

2.01 STATIC FLOORING

A. Static Control Tile **[RFT]:** Homogeneous; color and pattern throughout thickness.
   1. Manufacturers:
      a. Nora; Norament Grano ED **(Basis of Design).**
      b. Roppe Corporation; ESD Rubber Static Control Tile.
      c. StaticWorx; SD Architectural Rubber.
   2. Minimum Requirements: Rubber tile complying with ASTM F1344, Class 1, Type B.
   3. Electrical Resistance:
      a. Dissipative Tile (Material): Resistance between 1.0 megohms and 1000 megohms as tested in accordance with ASTM F150 or ANSI/ESD STM7.1.
      b. Dissipative Tile (System - Flooring and Footwear in combination with a person): Resistance between 1.0 megohms and 35 megohms as tested in accordance with ANSI/ESD STM97.1.
   4. Static Generation (System - Flooring and Footwear in combination with a person): Less than 100 V when tested per AATCC Test Method 134 or ANSI/ESD STM97.2.
   5. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   6. Tile Size: Manufacturer's standard.
   7. Total Thickness: 2 mm, minimum.
   8. Texture: Smooth.
   9. Color: To be selected by Architect from manufacturer's full range.

2.02 ACCESSORIES

A. Subfloor Filler: Type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
   1. For static-control flooring, provide types as required by manufacturer to maintain static dissipative properties of flooring system and grounded connection.
   2. VOC Content Limits: As specified in Section 016116.

C. Moisture Vapor Treatment: Where resilient flooring and accessories are installed over concrete slabs, and where field testing indicates high moisture vapor testing through concrete slabs,

provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab in accordance with Division 01 MVT allowance and unit price, and per the following:

1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
   a. Duraamen Engineered Products, Inc.; Perdure MVT.
   b. Maxxon Corporation; Maxxon MVP.
   c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
2. Performance Requirements:
   a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer’s warranty.
   b. Low-VOC: Provide product with VOC content less than 15 g/L.
   c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
   d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft^2/in-Hg, per ASTM F3010.
   e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

D. Copper Grounding Strips: Type and size as recommended by static control flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows: Perform one of each test per 1,000 sf of installation area.
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. If test results are not within limits recommended by flooring manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions.
   2. Fit joints and butt seams tightly.
   3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

G. Install flooring in recessed floor access covers, maintaining floor pattern.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern, unless otherwise indicated.

3.05 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.06 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 096536

SECTION 096700
FLUID-APPLIED FLOORING AND WALLS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

B. SCAQMD 1113 - Architectural Coatings.

1.02 ADMINSTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
   1. Require attendance by representatives of installer and other entities directly affecting, or affected by, construction activities of this section.
   2. Notify Architect four calendar days in advance of scheduled meeting date.

1.03 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

B. Selection Samples: Provide manufacturer's color charts illustrating full range of patterns and colors for each flooring material.

C. Verification Samples: Manufacturer's standard size physical samples, on rigid backing, illustrating each selected pattern and color.

D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.

F. Applicator's Qualification Statement.

G. Field Quality Control Reports: Submit inspection reports of manufacturer's technical representative.

H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section; certified and approved by manufacturer in writing.
   1. Approved by manufacturer.

1.05 MOCK-UPS

A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
   1. Number of Mock-Ups to be Prepared: One.
   2. Use same materials and methods for use in the work.
   3. Use approved design samples as basis for mock-ups.
   4. Locate where directed by Architect.
   5. Minimum Size: 48 inches by 48 inches.

B. See Section 014000 - Quality Requirements for additional requirements.

C. Obtain approval of mock-up by Architect before proceeding with work.

D. Approved mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.07 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 FLUID-APPLIED FLOORING SYSTEMS

A. Fluid-Applied Flooring **[RES]**: Hybrid cementitions system; urethane base coat and top coat, epoxy color coat with flakes.
   1. Aggregate: Vinyl flakes. 1/8"
   2. Top Coat: Manufacturer's recommended polyurethane.
   3. System Thickness: 3/16 inch, dry film thickness (DFT).
   4. VOC Content: Maximum 50 g/L in accordance with SCAQMD 1113.
   5. Texture: Slip resistant.
   6. Sheen: Satin.
   7. Color: To be selected by Architect from manufacturer's full range.
   8. Products:
      a. Sherwin-Williams Company; Hybri-Flex EC, Deco Flake 1/8" **(Basis of Design).**
      b. Elite Crete Systems; Hermetic Flake Single Broadcast System.
      c. Sika Corporation; Sikafloor Decodur Flake FX System.

2.02 ACCESSORIES

A. Base Caps: Zinc with projecting base of 1/8 inch; color as selected by Architect..

B. Fillet Strips: Molded of flooring resin material.

C. Crack Isolation: Manufacturer's recommended urethane elastomer membrane for protecting fluid-applied floor system against cracking.

D. Joint Control: Manufacturer's recommended polyurethane sealant and backer rod to limit damage from moving joints in the floor.

E. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

F. Primer: Type recommended by fluid-applied flooring manufacturer.

G. Moisture Vapor Treatment: Where fluid-applied flooring and accessories are installed over concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:

1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
   a. Duraamen Engineered Products, Inc.; Perdure MVT.
   b. Maxxon Corporation; Maxxon MVP.
   c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
2. Performance Requirements:
   a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
   b. Low-VOC: Provide product with VOC content less than 15 g/L.
   c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
   d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft^2/in-Hg, per ASTM F3010.
   e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Install manufacturer's recommended moisture vapor treatment at all locations to receive fluid-applied floor finish in accordance with manufacturer's instructions; moisture vapor treatment at fluid-applied flooring is not subject to MVT unit price or allowance specified in other sections.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Prepare concrete surfaces according to ICRI 310.2R, CSP 4, minimum, unless otherwise required by manufacturer's installation requirements.

C. Apply crack isolation compound to concrete slab in accordance with flooring manufacturer's instructions.

D. Apply, trowel, and float filler to achieve smooth, flat, hard floor surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

E. Vacuum clean substrate.

F. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - ACCESSORIES

A. Install cant strips at base of walls and corners where flooring is to be extended up wall as **6" cove base**.

B. Install joint control sealant and backer rod where indicated on Drawings in accordance with flooring manufacturer's instructions.

C. Install terminating cap strip at top of base; attach securely to wall substrate.

3.04 INSTALLATION - FLOORING AND WALLS

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

D. Install flooring to the center of cased openings, and into door openings such that the transition to other floor material occurs under the center of the door leaf. Where transitions occur to another flooring material, extend resinous flooring to suit transition.

E. Cove at vertical surfaces and corners and cap with metal base trim.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide services of manufacturer's technical representative to inspect for proper installation of fluid-applied flooring system and submit inspection report.

3.06 PROTECTION

A. Prohibit traffic on floor finish for minimum 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION 096700

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

E. CRI (GLP) - Green Label Plus Testing Program - Certified Products.

F. ILFI (DEC) - International Living Future Institute ‘Declare’ Program.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Substitutions/Prequalification: Manufacturers seeking consideration to bid their product as an acceptable alternative shall provide full product data and full range of selection samples during the bid period. Products that do not meet the technical and aesthetic criteria will not be accepted. No substitutions shall be permitted for carpet tile after receipt of bids.

1.03 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Shop Drawings: Indicate layout of joints, direction of carpet pile, dye lot, and location of edge moldings and transition strips.

1. Where multiple carpet tile products are specified (including multiple products in a single space installed in an indicated pattern), indicate on the shop drawings the locations where each product is being installed.

C. Selection Samples: Submit manufacturer's color charts indicating full range of colors for carpet tiles and for accessories.

D. Verification Sample: Submit full size sample for each required color, pattern, and texture.

1. Submit samples in manufacturer's standard size for each accessory product.

E. Sustainable Design Submittal: Submit VOC content documentation for adhesives.

F. Sustainable Design Submittal: Submit a copy of ILFI (DEC) Declare Label for each product.

G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1. Include specific procedures and materials that are not recommended, including those that may be harmful to carpet tile or that would void warranty.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.04 QUALITY ASSURANCE

A. Critical Radiant Flux: All carpet tiles shall be Class I rated, with a minimum CRF of 0.45 watts/sq cm, when tested by an independent testing agency in accordance with ASTM E648 or NFPA 253.

1.05 FIELD CONDITIONS, STORAGE AND HANDLING

A. Comply with the Carpet and Rug Institute (CRI) Publication "CRI 104 - Standard for Installation of Commercial Carpet." Comply with Section 4.0 for storage and handling, Section 7.0 for ambient temperature and ventilation, and Section 9.0 for Product Acclimation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Carpet Tile Warranty: Provide a ten (10) year manufacturer warranty, covering defective material and faulty installation.

1. Warranty shall cover excessive surface wear (defined as more than 10% loss by weight of face fiber), edge raveling, backing separation, shrinking, stretching, cupping, doming, static electricity, or color loss or fading.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting: Provide the basis-of-design carpet tiles or a prequalified alternate tile. No substitutions will be considered after the award of Contract.

1. Interface, Inc.
2. Mannington Commercial.
3. Tarkett Commercial Flooring.

2.02 MATERIALS

A. Tile Carpeting **[C-TILE-A]**: Tufted, manufactured in one color dye lot.

1. Product: Mend, Patchwork Panache manufactured by Mannington Commercial.
2. Tile Size: 12 by 36 inch, nominal.
   a. Fiber: Type 6,6 nylon or approved Type 6 cationic nylon.
3. Installation Pattern: Ashlar.
4. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
5. Sustainability Requirement: Provide ILFI (DEC) certified Red-List Free product.
6. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
7. Primary Backing Material: Manufacturer's standard; recycled vinyl with fiberglass reinforcing.

B. Tile Carpeting **[C-TILE-B]**: Tufted, manufactured in one color dye lot.

1. Product: Abrasic Action II manufactured by Tarkett Commercial.
2. Tile Size: 12 by 12 inch, nominal.
   a. Fiber: Type 6,6 nylon or approved Type 6 cationic nylon.
3. Installation Pattern: Monolithic.
4. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.

5. Sustainability Requirement: Provide ILFI (DEC) certified Red-List Free product.
6. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
7. Primary Backing Material: Manufacturer's standard; recycled vinyl with fiberglass reinforcing.

2.03 ACCESSORIES

A. Subfloor Filler: Type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, color as selected by Architect.

C. Moisture Vapor Treatment: Where carpeting and accessories are installed over concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:
   1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
      a. Duraamen Engineered Products, Inc.; Perdure MVT.
      b. Maxxon Corporation; Maxxon MVP.
      c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
   2. Performance Requirements:
      a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer’s warranty.
      b. Low-VOC: Provide product with VOC content less than 15 g/L.
      c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
      d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft^2/in-Hg, per ASTM F3010.
      e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows: Perform one of each test per 1,000 sf of installation area.
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. If test results are not within limits recommended by flooring manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).

C. To ensure minimal color variation, ensure that each space/room uses only carpet from the same dye lot.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines, unless otherwise indicated.

F. Locate change of color or pattern between rooms or at transitions to other finish flooring material directly under the door leaf centerlines, or at the center of cased openings.

G. Fully adhere carpet tile to substrate.

H. Install carpet tile into wall recesses, knee spaces under cabinets or countertops, closets, and other similar spaces.

I. Trim carpet tile neatly at walls and around interruptions.

J. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING AND PROTECTION

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

C. Protect installed carpet in accordance with CRI 104, Section 13.7 "Post Installation."

END OF SECTION 096813

SECTION 096817
TEXTILE COMPOSITE FLOORING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AATCC Test Method 16 - Colorfastness to Light.

B. AATCC Test Method 134 - Test Method for Electrostatic Propensity of Carpets.

C. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.

D. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

E. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

F. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

G. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

H. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

I. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

J. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

K. SCAQMD 1168 - Adhesive and Sealant Applications.

1.02 DEFINITION

A. Textile Composite Flooring: A hybrid floor covering consisting of a tufted loop nylon or polyester fiber wear layer thermally fused to a cushioned polyester backing, commonly referred to as textile composite flooring (TCF), vinyl cushion tufted textile (VCTT), or tufted textile flooring.

1.03 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Shop Drawings: Showing the extent of installation, seam direction of TCF, and accessories. Check pattern match, if any, for matching during installation and possible waste factors in ordering required amounts. Show TCF dye lot. Indicate built in items such as casework, columns, and doorways, and locations where cutouts are required in TCF.

1. Maintain a copy of approved shop drawings on site during installation, available for review by Owner and Architect.

C. Selection Samples: Submit manufacturer's standard color charts illustrating color and pattern design for each TCF product specified.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra TCF Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed, but not less than 10 square yards.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified textile composite flooring. Manufacturer shall have a technical field representative available for field observation and inspection.

B. Installer Qualifications: Company specializing in installing textile composite flooring, and complying with following:
   1. Installer shall be a specialty contractor normally engaged in the installation of TCF flooring, with prior experience installing these floor materials. Flooring contractor shall submit a list of installers certified by TCF manufacturer prior to bid.
   2. Flooring contractor shall be responsible for proper product installation, including floor substrate testing and preparation, in accordance with manufacturer's requirements and specifications.

1.05 FIELD CONDITIONS

A. Do not deliver or install until building is enclosed and HVAC system is operating at occupancy conditions.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

1.06 WARRANTY

A. Manufacturer's Warranty: The TCF warranty shall be the sole source responsibility of the manufacturer. Second source warranties or warranties that involve parties other than the TCF manufacturer are unacceptable.
   1. Warranty Term: 10 years minimum.
   2. In the event of failure due to material or workmanship, the warranty shall cover either repair or removal and replacement at manufacturer's discretion.
   3. The warranty shall not exclude TCF installed on stairs, provided the product installation was approved by manufacturer's field representative during final inspection, and provide the product was properly maintained.
   4. Wear Layer Warranty: Shall specifically define and cover against the following:
      a. Product performance.
      b. Colorfastness to light and crocking.
      c. Stain removal.
      d. Static protection.
      e. Zippering.
   5. Backing Layer Warranty: Shall specifically define and cover against the following:
      a. Edge ravel.
      b. Delamination.
      c. Dimensional stability.
   6. A 'tuft bind' warranty in lieu of edge ravel and zippering is not acceptable.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Textile Composite Flooring **[TCF]**:
   1. Forbo Flooring, Inc.; Flotex "Box Cross" **(Basis of Design)**.
   2. Jiashan Bohua Flocking Fabric Co. LTD; Bon Floor.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE CHARACTERISTICS

A. The following performance characteristics shall be met by all products:
   1. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
   2. Surface Flammability Ignition: Pass Federal Flammability CPSC FF 1-70 (also referenced as ASTM D2859 - the "pill test").
   3. Maximum Electrostatic Charge: Pass AATCC Test Method 134 (Step & Scuff): 3 Kv. or less at 20 percent relative humidity.
   4. Smoke Density: ASTM E662 / NFPA 258: < 450 Flaming Mode.
   5. Static Coefficient of Friction: ASTM C1028: Passes ADA Guidelines for Accessible Routes (Minimum 0.60).
   6. Delamination of Secondary Backing of Pile Floor Coverings: ASTM D3936: Minimum 15 lbs.
   7. Lightfastness: AATCC Test Method 16: > 4 @ 100 hours.
   8. Vetterman Drum: ASTM D5417: Minimum 3 @ 22,000 cycles.
   9. Seam Integrity: Seam to remain intact after 50,000 cycles per Phillips Chair Test.

B. Low-Emitting Materials:
   1. Flooring Products: Flooring products shall be tested and determined compliant in accordance with CAL (CDPH SM).
   2. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

2.03 MATERIALS

A. Textile Composite Flooring **[TCF]**: Tufted or flocked, manufactured in one color dye lot.
   1. Product: Flotex manufactured by Forbo Flooring, Inc..
   2. Tile Size: 39.37 by 9.84 inch, nominal.
   3. Color: As selected by Architect from manufacturer's full range.
   4. Wear Layer: Manufacturer's standard, polyester or nylon.
   5. Primary Backing Material: Cushioned recycled vinyl.

2.04 ACCESSORIES

A. Subfloor Filler: Type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, color as selected by Architect.

C. Moisture Vapor Treatment: Where textile composite floor and accessories are installed over concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:
   1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:

a. Duraamen Engineered Products, Inc.; Perdure MVT.
b. Maxxon Corporation; Maxxon MVP.
c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.

2. Performance Requirements:
   a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
   b. Low-VOC: Provide product with VOC content less than 15 g/L.
   c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
   d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft^2/in-Hg, per ASTM F3010.
   e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

D. Adhesive: Recommended by textile composite flooring manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive textile composite flooring.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows: Perform one of each test per 1,000 sf of installation area.
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. After testing is complete, prepare concrete and install moisture vapor treatment (MVT) in accordance with manufacturer's written instructions. If testing indicates measurements are within acceptable levels for flooring installation with the need for MVT, the MVT may be omitted where approved by the Architect.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply moisture vapor treatment (MVT) in accordance with manufacturer's instructions.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install TCF in accordance with manufacturer's instructions.

C. Cut TCF tile clean. Fit TCF tight to intersection with vertical surfaces without gaps.

D. Lay TCF tile in ashlar pattern, with pile direction parallel to next unit, set parallel to building lines.

E. To ensure minimal color variation, ensure that each space/room uses only carpet from the same dye lot.

F. Locate change of color or pattern or transition trim between rooms under door centerline.

G. Fully adhere TCF tile to substrate.

1. Free-lay and stretch-in installations are not acceptable.

H. Trim TCF neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 FIELD QUALITY CONTROL

A. Engage manufacturer's technical field representative to observe during substrate preparation and during installation, and to provide a final inspection after completion.

B. Remove and replace TCF where manufacturer's field inspection indicates that installation is not in compliance with the specified requirements or with manufacturer's instructions.

3.05 CLEANING AND PROTECTION

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum TCF surfaces.

C. Protect installed TCF from heavy construction traffic, soiling, and damage for the remainder of the construction period.

END OF SECTION 096817

SECTION 097200
WALL COVERINGS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

E. SCAQMD 1168 - Adhesive and Sealant Applications.

1.02 SUBMITTALS

A. Product Data: Provide data on wall covering and adhesive.

B. Shop Drawings: Indicate wall elevations with seaming layout.

C. Selection Samples: Provide manufacturer's full range of color and pattern information.

D. Verification Samples: Submit physical samples of each type of wall covering, illustrating color, finish, and texture; samples shall be full width by minimum 36 inches long.

E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.

F. Manufacturer's Installation Instructions: Indicate special procedures.

G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

1.03 MOCK-UPS

A. Provide panel, approximately 10 feet wide, full height, illustrating installed wall covering and joint seaming technique. Include inside and outside corner, as applicable.

B. Locate where directed by Architect.

C. Mock-up may remain as part of the Work.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.05 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.01 WALL COVERINGS

A. General Requirements:
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
   2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.
   3. Low-Emitting Materials:
      a. Paints and Coatings: Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.
      b. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

B. Acoustic Fabric Wall Covering **[AWC]**:
   1. Comply with ASTM F793/F793M, Category V, Type II.
   2. Manufacturers:
      a. MDC Wallcovering; Acoustical Resource - Monroe **(Basis of Design).**
      b. Wolf Gordon; Acoustical Wallcovering - Softrack.
      c. Momentum Textiles & Wallcoverings; Acoustic - Tranquility WC.
   3. **Direction: Railroaded**

C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.

D. Termination Trim: Extruded plastic, clear.

E. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

A. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

B. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

C. Surfaces: Correct defects and clean surfaces that affect work of this section.

D. Marks: Seal with shellac those that may bleed through surface finishes.

E. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

F. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION - WALLCOVERING

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Use wall covering in roll number sequence.

C. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

D. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

E. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

F. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

G. Do not install wall covering more than 1/4 inch below top of resilient base.

H. Apply wall covering to electrical wall plates prior to replacing.

I. Install termination trim.

J. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION 097200

SECTION 098430
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests.

1.02 SUBMITTALS

A. Product Data: Manufacturer's printed data sheets for products specified.

B. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.

C. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.

D. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a two-year period for failure of materials or workmanship commencing on the Date of Substantial Completion.

1. Failures include but are not limited to acoustic performance, fabric separation from core or fabric sagging, panel distortion or warping.

PART 2 PRODUCTS

2.01 POLYESTER (FELT) ACOUSTIC PANELS

A. Manufacturers:

1. Filzfelt.
2. Momentum.
3. MDC Interior Solutions.

B. Flat-Face Acoustic Panels **[AWP-A1]:**

1. Products:
   a. Filzfelt; Index Linear **(Basis of Design).**
   b. Momentum; Cube.

c. MDC Interior Solutions; Zintra Tablet ABC.

2. Size: As indicated on Drawings.
3. Thickness: 8- to 12-mm panel, as standard with manufacturer.
4. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
5. Noise Reduction Coefficient (NRC): 0.60 at 24 mm panel thickness when tested in accordance with ASTM C423for Type A mounting (direct mount), per ASTM E795.
6. Color: Solid color as selected from manufacturer's full range of available colors.
7. Mounting Method (Wall): Direct wall mount with adhesives.

C. Flat-Face Acoustic Panels **[AWP-A2]:**

1. Products:
   a. Filzfelt; Index Linear **(Basis of Design).**
   b. Momentum; Cube.
   c. MDC Interior Solutions; Zintra Tablet ABC.
2. Size: As indicated on Drawings.
3. Thickness: 8- to 12-mm panel, as standard with manufacturer.
4. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
5. Noise Reduction Coefficient (NRC): 0.60 at 24 mm panel thickness when tested in accordance with ASTM C423for Type A mounting (direct mount), per ASTM E795.
6. Color: Solid color as selected from manufacturer's full range of available colors.
7. Mounting Method (Wall): Direct wall mount with adhesives.

D. Textured-Face Acoustic Panels **[AWP-B]:**

1. Products:
   a. Filzfelt; Ribsy **(Basis of Design).**
   b. Momentum; Tile Cross Cut.
   c. MDC Interior Solutions; Fluted.
2. Size: As indicated on Drawings.
3. Thickness: 8- to 16-mm panel, as standard with manufacturer.
4. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
5. Noise Reduction Coefficient (NRC): 0.60 at 24 mm panel thickness when tested in accordance with ASTM C423for Type A mounting (direct mount), per ASTM E795.
6. Color: Solid color as selected from manufacturer's full range of available colors.
7. Mounting Method (Wall): Direct wall mount with adhesives.

2.02 FABRICATION

A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.03 ACCESSORIES

A. Panel Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Install mounting accessories and supports in accordance with shop drawings.

C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

D. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:

1. Plumb and level.
2. Flatness.
3. Width of joints between panels; where applicable.

3.03 CLEANING

A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION 098430

SECTION 099100
PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior and interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated. Specific items include (but are not limited to) the following:

1. Fire- and Smoke-Rated Wall Identification: Permanently label fire- and smoke-rated walls, partitions, and barriers per requirements of applicable building code. Labeling shall include fire-resistance rating, type of assembly, and instruction to protect openings/penetrations. Example text: "ONE HOUR FIRE BARRIER - PROTECT ALL OPENINGS".
    a. Locate lettering in concealed accessible floor, floor-ceiling plenums, and attic spaces, located no more than 15 feet from end of wall and at horizontal intervals not exceeding 30 feet, with stenciled lettering not less than 3 inches high with minimum 3/8-inch strokes. Locate directly inside of access doors or panels that provide access to rated walls. Do not paint walls where exposed to view except in support spaces (mechanical / electrical rooms and similar spaces).
    b. Refer to the life safety plans and partition schedule on the drawings for rated wall and partition locations.
2. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
3. Elevator pit ladders.
4. Prime surfaces to receive wall coverings.
5. Mechanical and Electrical:
    a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
    b. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
    c. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
6. Shop-Primed Items: In finished areas, paint shop-primed items. Unless specifically indicated that additional field primer is not required, provide a tie coat primer over the shop primer before top coat(s) are applied.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
6. Marble, granite, slate, and other natural stones.

7. Floors, unless specifically indicated.
8. Ceramic and other tiles.
9. Brick, architectural concrete, architectural precast, cast stone, and integrally colored plaster, fiberglass, or stucco.
10. Glass.
11. Acoustical materials, unless specifically indicated.
12. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

C. SSPC-SP 1 - Solvent Cleaning.

D. SSPC-SP 6 - Commercial Blast Cleaning.

1.03 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.05 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Paints:
   1. Sherwin-Williams Company **(Basis of Design).**

2. PPG Paints.
3. Benjamin Moore.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Low-Emitting Materials (Paints and Coatings): Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.

2.03 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Masonry:

1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.

H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

I. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 EXTERIOR PAINT SCHEDULE

A. General: Provide the following Paint systems for the various substrates, as indicated. Dry film thickness is noted as “DFT.” Provide compatibility test areas on existing painted substrates.

B. Zinc-Coated or Zinc-rich Primer-Coated Metal with Direct to Metal (“DTM”) Gloss Acrylic Enamel Finish: 2 topcoats of DTM gloss enamel over primer, with min. total DFT of 2.5 mils.
   1. Prime Coat (Tie-Coat): Lead-free, acrylic base interior/exterior galvanized metal primer, premium grade. Apply over shop primer.
      a. Moore: HP04 Ultra Spec HP Acrylic Metal Primer.
      b. PPG: 90-1908 Pitt-Tech Plus EP Acrylic Primer/Finish.
      c. S-W: B66W1310 Pro Industrial Pro-Cryl Universal Acrylic Primer.
   2. First and Second Coats: DTM Acrylic Gloss Enamel.

a. Moore: HP28 Ultra Spec HP Acrylic Gloss Enamel.
b. PPG: 90-1510 Pitt-Tech Plus EP DTM Acrylic Gloss.
c. S-W: B66W1051 Pro Industrial DTM Acrylic Coating (Gloss).

C. Field-Applied Coatings for Ferrous Metal (AESS): Aliphatic urethane system of intermediate coat and topcoat. Provide scheduled products for exposed steel fabrications indicated as AESS.
1. Field Touch-up: Match moisture curing urethane zinc-rich shop primer.
2. Intermediate Coat: Moisture curing urethane and micaceous iron oxide or epoxy.
a. Moore: Corotech V160 Epoxy Mastic Coating.
b. PPG: PMC Amerlock 600.
c. S-W: Macropoxy 646 Fast Cure Epoxy, B58-600/B58v600.
3. Top Coat: Aliphatic urethane at 2.0 – 3.0 mils DFT.
a. Moore: Corotech V500 Aliphatic Acrylic Urethane.
b. PPG: 95-812 Pitthane Ultra Gloss Urethane Enamel.
c. S-W: Corothane I Aliphatic Finish Coat B65.

D. Coatings to Repaint Exterior Ferrous Metal: Aliphatic urethane topcoat system over surface-tolerant epoxy mastic. Provide to repaint existing exposed steel fabrications with extended weather exposure deterioration and surface rust.
1. Preparation: Clean steel to SSPC SP-3 Power Tool Cleaning to remove all rust scale, mill scale and loose rust, oil, grease and other contaminants.
2. Primer: Surface-tolerant fast curing polyamide epoxy (mastic). 5.0 – 10.0 mils DFT.
a. Moore: P45 Mastic Epoxy Gloss Coating.
b. PPG: PMC Amerlock 600.
c. S-W: Macropoxy 646 Fast Cure Epoxy.
3. First and Second Top Coats: Aliphatic urethane at 3.0 – 4.0 mils DFT per coat
a. Moore: P74 Aliphatic Acrylic Urethane.
b. PPG: 95-8930 Pitthane Ultra LS.
c. S-W: B65-300 Series / B60V30 Hi-Solids Polyurethane.

E. Concrete: Acrylic latex satin finish, two finish coats over alkali-resistant primer with minimum total DFT of not less than 3.5 mils.
1. Prime Coat: Exterior Acrylic weathered masonry sealer/primer.
a. Moore: 608 Ultra Spec Masonry Int/Ext 100% Acrylic Sealer/Primer.
b. PPG: 4-603 Perma-Crete Int/Ext Alkali Resistant Primer.
c. S-W: A24w8300, Loxon Concrete & Masonry Primer.
2. First and Second Finish Coats: Exterior 100% Acrylic – Satin sheen; premium grade.
a. Moore: N401 Regal Select Exterior Paint High Build Low Lustre Finish.
b. PPG: 76-45 Sun-Proof Ext House & Trim, Satin.
c. S-W: A82 Series A-100 Exterior Latex Satin.

F. Concrete Masonry Units: Acrylic latex satin finish, two finish coats over primer with minimum total DFT of not less than 3.5 mils.
1. Prime Coat: Exterior Acrylic weathered masonry sealer/primer.
a. Moore: 571 Ultra Spec Hi-Build Masonry Block Filler.
b. PPG: 6-15 Speedhide Int/Ext Acrylic Masonry Block Filler.
c. S-W: A24W200 Loxon Block Surfacer.
2. First and Second Finish Coats: Exterior 100% Acrylic – Satin sheen; premium grade.

a. Moore: N401 Regal Select Exterior Paint High Build Low Lustre Finish.
b. PPG: 76-45 Sun-Proof Ext House & Trim, Satin.
c. S-W: A 82 Series A-100 Exterior Latex Satin.

G. Exterior Gypsum Soffit Board with Smooth Finish 100% Acrylic Coating: Top coat(s) for total DFT of 10.0 mils minimum over primer-sealer.
1. Prime Coat (Tie-Coat): Bonding primer-sealer.
a. Moore: N023 Fresh Start All Purpose 100% Acrylic Int/Ex Latex Primer.
b. PPG: 17-921 Seal-Grip Gripper Interior/Exterior 100% Acrylic Latex Primer.
c. S-W: B51-450, Multi-Purpose Primer.
2. First and Second Finish Coats: Exterior 100% Acrylic – Flat finish; premium grade.
a. Moore: N400 Regal Select Exterior Paint High Build Flat Finish.
b. PPG: 72-45 Sun-Proof Ext House & Trim. Flat Latex 100% Acrylic
c. S-W: A6 Series A-100 Exterior Latex Flat

H. General Painted Wood and Plywood with Acrylic Latex Satin Finish: 2 finish coats over primer with total DFT not less than 3.5 mils.
1. Prime Coat: Alkyd-based wood sealer/primer.
a. Ben Moore: 024 Fresh Start Multi-Purpose Oil Based Primer.
b. PPG: 17-941 Seal-Grip Interior/Exterior Alkyd Universal Primer.
c. S-W: Y24W8020 Exterior Oil Wood Primer.
2. First and Second Finish Coats: Exterior 100% Acrylic – Satin sheen; premium grade.
a. Moore: N401 Regal Select Exterior Paint High Build Low Lustre Finish.
b. PPG: 76-45 Sun-Proof Ext House & Trim, Satin.
c. S-W: A82 Series A-100 Exterior Latex Satin.

I. Exterior Wood Dumpster Enclosure Siding and Trim with Solid Color Latex-Emulsion Stain: 2 Finish coats.
1. Stain Coat: Acrylic latex solid color stain.
a. Moore: 610 ArborCoat Exterior Stain - Solid Ultra Flat.
b. Cabot: Cabot O.V.T. Solid Color Acrylic Stain.
c. PPG: FLD820, Flood Solid Color 100% Acrylic Latex Base Stain.
d. S-W: A16, Woodscapes Exterior Solid Acrylic Stain.

3.07 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated. Dry film thickness is noted as “DFT.” Provide compatibility test areas on existing painted substrates.

B. Concrete Masonry Units: Low-VOC Acrylic Satin Finish. 2 Coats over filler, with total DFT not less than 2.5 mils. (Provide for CMU except where “epoxy finish” is indicated.)
1. Filler Coat, 100% Acrylic. Apply filler coat at a rate to ensure complete coverage. Brush, spray or roller apply and back roll or squeegee for smooth, pinhole-free treatment.
a. Moore: 571 Ultra Spec Hi-Build Masonry Block Filler.
b. PPG: 16-90 Pitt Glaze WB Acrylic Interior Exterior Block Filler.
c. S-W: B46W150 Pro Industrial Heavy Duty Block Filler. (PrepRite not acceptable)
2. Waterproofing Filler Coat – Showers & Wet Applications: Cementitious resin or epoxy block filler applied by brush, spray or roller and back rolled or squeegeed for smooth, pinhole-free treatment.
a. Moore: P31 Waterborne Epoxy Block filler.
b. PPG: 95-217 Epoxy Ester Cementitious Waterproofing Block Filler.

c. S-W: B42W400/B42V401 Kem Cati-Coat HS Epoxy Filler/Sealer.

3. Bonding Primer (previously painted): Acrylic bonding primer for exceptional adhesion to hard, glossy surfaces. Test for adhesion. Brush, spray or roller apply and back roll.
   a. Moore: Stix Bonding Primer.
   b. PPG: 17-921 PPG Seal Grip Acrylic Universal Primer/Sealer.
   c. S-W: B51W150 Extreme Bond Interior/Exterior Primer.
4. First & Second Finish Coats: Commercial Interior Low-VOC Acrylic Satin Finish. Provide for wall finishes unless directed otherwise.
   a. Moore: N538 Ultra Spec 500 Interior Eggshell Finish.
   b. PPG: 6-411ZV Speedhide Interior Eggshell Latex.
   c. S-W: B20-12650 ProMar 200 Zero VOC Interior Latex Eg-Shel.

C. Concrete Masonry Units - Semi-Gloss Water-Borne Epoxy Finish: 2 Coats over filler:
1. Block Filler Coat: Acrylic-latex or as required by manufacturer for topcoat. Brush, spray or roller apply and back roll for smooth pinhole-free treatment.
   a. Moore: 571 Ultra Spec Hi-Build Masonry Block Filler.
   b. PPG: 6-15 Speedhide Int/Ext Acrylic Masonry Block Filler.
   c. PPG: 16-90 Pitt-Glaze WB Int/Ext Block Filler Latex.
   d. S-W: B46W150 Pro Industrial Heavy Duty Block Filler.
2. First and Second Coats: Two-component, semi-gloss water born polyamide epoxy enamel applied at a DFT of 1.5 to 4.0 mils per coat.
   a. Moore: Corotech V400 Polyamide Epoxy Coating.
   b. PPG: 98E-xx Base / 98E-100 Aquapon WB EP Water Based Epoxy – Semi-Gloss.
   c. S-W: B73W360 / B73V300 Pro Industrial Water Based Catalyzed Epoxy.

D. Concrete Floor with Semi-Gloss Water-Base Acrylic Floor Enamel: 2 Coats over primer on cured surface. Concrete must cure a minimum of 30 days before painting and have pH of 10.0 or lower. Prepare per SSPC-SP13, shot blast or prepare floor by other means acceptable to paint manufacturer (accepted in writing) prior to painting.
1. Primer Coat: Acrylic, self-priming finish enamel; brush or roller applied over prepared concrete.
   a. Moore: 122 Moore's Latex Floor and Patio Enamel (thinned 1 pint/gallon).
   b. PPG: 3-510 Pittsburgh Floor, Porch & Deck Satin Latex.
   c. S-W: B90 Armorseal Tread-Plex.
2. First and Second Finish Coats: Semi-gloss water-based acrylic floor enamel or comparable performance enamel. Provide 1.5 - 2.0 mils DFT per coat.
   a. Moore: 122 Moore’s Latex Floor and Patio Enamel.
   b. PPG: 3-510 Pittsburgh Floor, Porch & Deck Satin Latex.
   c. S-W: B90 Armorseal Tread-Plex.

E. Concrete Floor with Gloss Water-Base Epoxy Floor Enamel: 2 Coats over primer on cured surface. Concrete must cure a minimum of 30 days before painting and have pH of 10.0 or lower. Prepare per SSPC-SP13, shot blast or prepare floor by other means acceptable to paint manufacturer (accepted in writing) prior to painting.
1. Primer Coat: Epoxy primer, brush or roller applied over prepared concrete. Provide 1.5 - 2.0 mils DFT per coat or as recommended by manufacturer.
   a. Moore: P41 Fast Dry Epoxy Floor Sealer/Finish.
   b. PPG: 98E-1 Series Aquapon WB EP Water Base Epoxy 2.0 mils to 3.0 mils DFT per coat.
   c. S-W: B70-8100/B70V8100 Armorseal 8100 Water based Epoxy Floor Coating.

2. Two Finish Coats: Two-component waterborne catalyzed polyamide epoxy floor enamel or comparable performance enamel. Provide 1.5 - 2.0 mils DFT per coat or as recommended by manufacturer.
    a. Moore: P42 Waterborne Polyamide High Gloss Epoxy Enamel 2.0 mils to 3.0 mils DFT per coat.
    b. PPG: 98E-1 Series Aquapon WB EP Water Base Epoxy 2.0 mils to 3.0 mils DFT per coat.
    c. S-W: B70-8100/B70V8100 Armorseal 8100 Water based Epoxy Floor Coating.

F. Gypsum Board Systems with Latex Finish: Satin (egg-shell) finish at walls and flat finish on ceilings except as indicated otherwise. Provide best commercial Zero-VOC formulation with 0 VOC per EPA test method 24.
1. Filler Coat: 0 VOC (per EPS test method 24) Latex Primer.
    a. Moore: N534 Ultra Spec 500 Interior Latex Primer.
    b. PPG: 9-900 Pure Performance Interior Latex Primer.
    c. S-W: B28-2600 ProMar 200 Zero VOC Interior Latex Primer.
2. First & Second Finish Coats: Interior Zero-VOC Acrylic Satin Finish. (Low lustre/Satin = 25-45% @60°) Provide for wall finishes unless indicated otherwise.
    a. Moore: N538 Ultra Spec 500 Interior Eggshell.
    b. PPG: 6-411ZV Speedhide Interior Eggshell Latex.
    c. S-W: B20-12650 ProMar 200 Zero VOC Interior Latex Eg-Shel.
3. First & Second Finish Coats: Interior Zero-VOC Acrylic Flat Finish. Provide for ceiling applications unless indicated otherwise.
    a. Moore: N536 Ultra Spec 500 Interior Flat.
    b. PPG: 6-70ZV Speedhide Interior Latex Flat.
    c. S-W: B30-2600 ProMar 200 Zero VOC Interior Latex Flat or B30-4650 ProMar 400 Zero VOC Interior Latex Flat.

G. Gypsum Board Systems with Water-Borne Polyamide Epoxy Finish (“EPX”):
1. Filler Coat: Manufacturer’s recommended primer.
    a. Moore: 217 Fresh Start Alkyd Enamel Underbody.
    b. PPG: 6-2 Speedhide Interior Latex Sealer.
    c. S-W: B28W2600 ProMar 200 Zero VOC Primer.
2. First and Second Coats: Two-component, water born polyamide epoxy enamel applied at a DFT of 1.5 to 4.0 mils per coat. Provide semi-gloss finish unless directed otherwise.
    a. Moore: Corotech V440 Waterborne Amine Epoxy.
    b. PPG: 98E-xx Base / 98E-100 Aquapon WB EP Water Based Epoxy – Semi-Gloss.
    c. S-W: B73W360 / B73V300 Water Based Catalyzed Epoxy.

H. Gypsum Board Systems with “Abuse-Resistant Coating” Finish: Satin (egg-shell) sheen abuse-resistant finish.
1. Filler Coat:
    a. Moore: N534 Ultra Spec 500 Interior Latex Primer.
    b. Master Coating: Scuffmaster “Primemaster” Primer/Sealer.
    c. S-W: B28W2600 ProMar 200 Zero VOC Primer.
2. First & Second Finish Coats: Interior Satin Finish. (Low lustre/Satin = 25-45% @60°) Provide for abuse-resistant wall finishes indicated.
    a. Moore: 485 Ultra Spec “SCUFF-X” proprietary single component acrylic copolymer.

b. Master Coating: Scuffmaster “Scrubtough” 2-component polyurethane-fortified coating.
c. S-W: S23W0051 Scuff Tuff Interior Waterbased Enamel.

I. Ferrous Metal with Latex Dry Fog Finish: One finish coat over primed exposed construction. Provide nominal 50 square foot sample area to test for paint compatibility with substrates.
1. Prime Coat: (Acrylic or recommended VOC-compliant metal primer for surfaces not pre-primed.) 2.0 mils DFT.
a. Moore: N110 Superkote 5000 DryFall Latex Flat.
b. PPG: 90-1908 Pitt-Tech Plus EP Acrylic Primer/Finish.
c. S-W: B66-1300 Series Pro Industrial Pro-Cryl Universal Acrylic Primer.
2. Top Coat: All exposed structure as scheduled. Acrylic Dry Fog 3.0 mils DFT. Provide color finish as selected by Architect from manufacturer's full range.
a. Moore: N110 Superkote 5000 DryFall Latex Flat.
b. PPG: 6-725XI Speedhide Super Tech WB Int. Dry-Fog Flat Latex Flat.
c. S-W: B42W1181 / B42B81 Waterborne Acrylic Dry Fall, Flat.

J. Ferrous Metal: Direct to Metal (“DTM”) Acrylic Enamel Finish: 2 Coats over primer, with total DFT not less than 2.5 mils. Provide satin finish at hollow metal steel doors and frames, and semi-gloss at other applications.
1. Prime Coat: Lead-free, acrylic base primer. Not required on shop primed items.
a. Moore: HP29 Ultra Spec HP DTM Acrylic Semi-Gloss.
b. PPG: 90-1908 Pitt-Tech Plus EP Acrylic Primer/Finish.
c. S-W: B66W11 Pro Industrial DTM Acrylic Primer/Finish (or B66 W200).
2. Bonding Primer (previously painted): Acrylic bonding primer designed for previously painted ferrous metal to ensure secure bond. Brush, spray or roller apply and back roll.
a. Moore: SXA-110 Insl-X Waterborne Bonding Primer.
b. PPG: 90-1908 Pitt-Tech Plus EP Acrylic Primer/Finish.
c. S-W: B66A50 DTM Bonding Primer.
3. First and Second Coat: DTM Acrylic Semi-Gloss Enamel. (30-40 units @ 60°)
a. Moore: HP29 Ultra Spec HP DTM Acrylic Semi-Gloss.
b. PPG: 90-1610 Pitt-Tech Plus EP DTM Acrylic Semi-Gloss.
c. S-W: B66W1151 Pro Industrial DTM Acrylic Semi-Gloss Coating.
4. First and Second Coat: DTM Acrylic Satin Enamel. Provide for hollow metal steel doors and frames. (15-25 units @ 60°)
a. Moore: HP25 Ultra Spec HP DTM Acrylic Low Lustre.
b. PPG: 90-1710 Pitt-Tech Plus EP DTM Acrylic Satin.
c. S-W: B66W1251 Pro Industrial DTM Acrylic Eg-Shel.

K. Zinc-Coated Metal: Semi-Gloss Direct to Metal (“DTM”) Acrylic Enamel Finish: 2 Coats over primer, with min. total DFT of 2.5 mils.
1. Prime Coat: Lead-free, acrylic base interior galvanized metal primer, premium grade.
a. Moore: HP04 Ultra Spec HP Acrylic Metal Primer.
b. PPG: 90-1908 Pitt-Tech Plus EP Acrylic Primer/Finish.
c. S-W: B66W1151 Pro Industrial DTM Acrylic Semi-Gloss Coating.
2. First and Second Coats: DTM Acrylic Semi-Gloss Enamel. Same as for ferrous metal.

L. Intumescent Mastic-Coated Metal: Semi-Gloss Direct to Metal (“DTM”) Acrylic Enamel Finish as approved by intumescent coating manufacturer: 2 Coats, with min. total DFT of 2.5 mils.

M. Painted Woodwork and Hardboard: Semi-Gloss Acrylic Enamel Finish: Two topcoats over undercoater. Provide at painted wood shelving, electrical panel boards, and as noted.
   1. Prime Coat: Interior Oil Undercoat.
      a. Moore: 024 Fresh Start Multi-Purpose Interior/Exterior Oil Based Primer.
      b. PPG: 17-941NF Seal Grip Int/Ext. Alkyd Universal Primer.
      c. S-W: B49 W8820 Multi-Purpose Oil-Based Primer.
   2. Prime Coat: Interior Latex Undercoat, for medium-duty, low-VOC formulation.
      a. Moore: N023 Fresh Start Multi-Purpose Latex Primer.
      b. PPG: 17-921 Seal Grip Int/Ext Acrylic Universal Primer.
      c. S-W: B28 W811 Premium Wall & Wood Primer.
   3. First and Second Finish Coats: DTM Acrylic Semi-Gloss Enamel. DFT 3.5 Mils min.
      a. Moore: HP29 Ultra Spec DTM Acrylic Semi-Gloss.
      b. PPG: 90-1110 Pitt-Tech Int/Ext Satin DTM Industrial Enamel.
      c. S-W: B66W1150 Series Pro Industrial DTM Acrylic Semi-Gloss Coating.
   4. First and Second Finish Coats: Premium Acrylic Semi-Gloss Enamel <150 g/L. DFT 3.5 Mils min.
      a. Moore: 551 Regal Select Semi-Gloss.
      b. PPG: 87-6 Manor Hall Interior Semi-Gloss Acrylic Latex.
      c. S-W: B31W20 ProClassic Waterborne.

N. Stained woodwork with transparent finish is specified in Division 6 Sections by woodworker.

END OF SECTION 099100

SECTION 101100
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard.

B. ANSI A208.1 - American National Standard for Particleboard.

C. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard, trim, and accessories.

B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

C. Samples: Color charts for selection of color and texture of porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surface covering, and trim.

D. Test Reports: Show compliance to specified surface burning characteristics requirements.

E. Maintenance Data: Include data on regular cleaning, stain removal.

1.03 DELIVERY, STORAGE AND HANDLING

A. Factory-fabricate visual display units and deliver as fully assembled units to greatest extent possible.

B. Deliver and store visual display units with protective packaging. Do not remove protective covers until ready to install.

C. Store visual display units in a dry, enclosed space. Do not install until installation spaces are enclosed and conditioned at occupancy conditions.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide fifty year warranty for markerboard porcelain face surface to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards: Magnetic, porcelain-enamel steel face sheet bonded to manufacturer's standard core. Provide with foil backer where mounted to exterior walls.
   1. Color: White.
   2. Height: 48 inches, unless otherwise indicated on Drawings.
   3. Length: As indicated on Drawings.
   4. Frame: Extruded aluminum, with concealed fasteners.
   5. Frame Finish: Anodized, natural.
   6. Accessories: Provide marker tray and map rail.
   7. Products:
      a. AARCO Products, Inc.
      b. ASI Visual Display Products.

c. Bangor Cork Company, Inc.
d. Claridge Products and Equipment, Inc.
e. Ghent; a GMI Company.
f. Marsh Industries, Inc; Visual Products Group.
g. MooreCo, Inc.
h. Nelson Adams NACO.
i. Platinum Visual Systems.
j. Polyvision Corporation.

2.02 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Hardboard for Cores: ANSI A135.4, Class 1 - Tempered, S2S (smooth two sides).

C. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.

D. Foil Backing: Aluminum foil sheet, 0.005 inch thick. Provide foil backing on units indicated to be mounted on exterior walls.

E. Adhesives: As recommended by manufacturer.

2.03 ACCESSORIES

A. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

B. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.

C. Mounting Brackets: Concealed.

D. Mounting Accessories and Fasteners: Provide concealed Z-clips and hangers, and stainless steel screws or anchors for mechanical attachment of visual display units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

C. Verify flat wall surface for frameless adhesive-applied boards.

3.02 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Install with top of marker tray at 36 inches above finished floor.

C. Secure units level and plumb.

D. Mechanical Fastening: Install all visual display units for secure attachment with manufacturer's recommended concealed clips, hangers, and mechanical fasteners. Installation with adhesive is not acceptable.

3.04 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION 101100

SECTION 101400
SIGNAGE

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

B. ADA Standards - 2010 ADA Standards for Accessible Design.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Allowance: Interior and exterior panel signage shall be covered by allowance; refer to Section 012100 - Allowances.

B. Pre-Fabrication Meeting: The signage contractor shall meet with representatives of the Owner to develop a Signage Schedule, including signage style and layout, individual sign locations, including locations of code required signage and wayfinding signage, and final room naming and numbering. The Architect will provide the graphics contractor with reproducible floor plan drawings for use in determining sign locations.

1.03 SUBMITTALS

A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

B. Signage Schedule (After Pre-Fabrication Meeting): Submit schedule with information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. Submit for approval by Owner through Architect prior to fabrication.

C. Selection Samples: Where colors are not specified, submit color selection charts or chips for each type of signage.

D. Verification Samples: Submit samples, manufacturer's standard size, showing selected colors for each type of signage.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.05 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Toilet room signage shall include pictograms and international symbol of accessibility.

2.02 PANEL SIGNAGE TYPES

A. General: Interior and exterior panel signage shall be provided via lump-sum allowance; refer to Division 1 Section "Allowances."

B. Manufacturers:
   1. Allen Industries Architectural Signage.
   2. APCO Graphics, Inc.
   3. ASI-Modulex, Inc.
   4. Best Sign Systems, Inc.
   5. Gemini Incorporated.
   6. Innerface Sign Systems, Inc.
   7. InPro Corporation.
   8. Matthews International Corporation, Bronze Division.
   9. Mohawk Sign Systems.
   10. Nelson-Harkins Industries.
   11. Seton Identification Products.
   12. The Supersine Company.
   13. Welch Sign.
   14. Worth Higgins and Associates.
   15. Substitutions: See Section 016000 - Product Requirements.

C. Photopolymer Panel Signage: Signage media without frame.
   1. Signage Material: 0.032-inch water wash photopolymer face layer over a 0.160-inch phenolic or 0.120-inch PETG base layer.
   2. Edges: Square.
   3. Corners: Square.
   4. Wall Mounting of One-Sided Signs: Tape adhesive.
      a. For signs mounted to glass, such as at door sidelights, provide a rear cover plate so the backside of sign will not be visible through the glass.
   5. Tactile Signage: Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.

D. Aluminum Panel Signage: Fabricate of minimum 0.063-inch aluminum sheet, without frame, with baked enamel finish. Wall mount with stainless steel fasteners in each corner. Not acceptable at locations requiring tactile signage.

E. Color and Font: Unless otherwise indicated, panel signage, font, and color shall be selected from manufacturer's full range.

F. Code-Required Signage: In addition to the room signage, provide panel signage required by accessibility regulations and requirements of authorities having jurisdiction, including, but not limited to, the following:

1. Tactile exit signs, stairway identification signs, room maximum capacity signs, elevator signs, and accessible space signs.
2. Refer to Division 26 and Electrical Drawings for illuminated exit signs.

2.03 PLAQUES

A. Manufacturers:
1. Advance Corporation; Braille-Tac Division.
2. A.R.K. Ramos.
3. Gemini Incorporated.
4. Matthews International Corporation, Bronze Division.
5. Metal Arts; Division of L&H Manufacturing Co.
6. Mills Manufacturing Company.
7. Nelson-Harkins Industries.
8. The Southwell Company.
9. Worth Higgins and Associates.
10. Substitutions: See Section 016000 - Product Requirements.

B. Metal Plaques:
1. Metal: Bronze casting.
2. Size: For bid purposes assume one 36 inch by 24 inch plaque, with a 6 inch diameter graphic logo / county seal (image to be provided by Owner) and raised text. Confirm final size and desired information, text, and typeface, with Owner.
3. Surface Finish: Brushed, satin.
4. Painted Background Color: As selected by Architect from manufacturer's standard background colors.
5. Protective Coating: Manufacturer's standard clear coating.
6. Mounting: Stud mounted, with concealed studs.

2.04 DIMENSIONAL LETTERS

A. Manufacturers:
1. A.R.K. Ramos.
2. ASI-Modulex, Inc.
3. Charleston Industries, Inc.
4. Gemini Incorporated.
5. Innerface Sign Systems, Inc.
6. Matthews International Corporation, Bronze Division.
7. Metal Arts; Division of L&H Manufacturing Co.
8. Mills Manufacturing Company.
9. Mohawk Sign Systems.
10. Superior Signs.
11. Worth Higgins and Associates.
12. Substitutions: See Section 016000 - Product Requirements.

B. Metal Letters:
1. Metal: Aluminum casting.
2. Letter Thickness: Provide manufacturer's standard for heights indicated, or as follows:
   a. 9 inches high or less: 3/4 inch thick.
   b. 10- to 14-inches high: 1 inch thick.

c. 15- to 17-inches high: 1-1/4 inches thick.
d. 18 inches high or more: 1-1/2 inches thick.

3. Letter Height: As indicated on drawings.
4. Text and Typeface: As indicated; where not indicated, as selected by Architect from manufacturer's full range of fonts.
   a. Verify final text at each location with Owner prior to furnishing.
5. Finish: Painted; color as selected by Architect from manufacturer's full range.
6. Mounting: Fabricate dimensional lettering for the following mounting types:
   a. Projected Wall Mounted (Exterior Wall Mount): Cast studs into the back of each letter for wall mounting at location indicated. Studs shall be sized to extend through cladding and fasten to structural substrate. Provide for a 1/2-inch gap between back of letter and face of cladding. Do not mount directly flush to wall surface.
   b. Flush Wall Mounted (Interior Wall Mount Only): Cast studs into back of each letter for mounting to wall. Mount flush to wall surface with no gap behind letters.
   c. Bottom Rail Mount (Exterior, Canopy Mounted): Provide characters with flattened base, and fasten to an aluminum C-channel rail with stainless steel screws. Rail shall have black enamel finish. Provide vertical post supports extending to structural substrate and fasten securely and seal penetrations watertight.

2.05 APPLIED VINYL CHARACTERS

A. Applied Vinyl Letters/Numbers: Provide die cut vinyl film characters of 3 mil minimum nominal thickness. Characters shall have manufacturer's standard adhesive backing suitable for outdoor or indoor installation. Refer to Drawings for locations.

2.06 ACCESSORIES

A. Concealed Screws: Stainless steel, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
   1. Room Signs: Mount on latch side, with a clear space of 18 inches by 18 inches beyond the door swing arc, centered on the tactile characters. At double doors, mount to the right of right-hand leaf or on nearest adjacent wall. Mount at height that is compliant with ADA Standards.

D. Mounting, Dimensional Letters:
   1. Projected Wall Mounted (Exterior Wall Mount): Cast studs into the back of each letter for wall mounting at location indicated. Studs shall be sized to extend through cladding and fasten to structural substrate. Provide for a 1/2-inch gap between back of letter and face of cladding. Do not mount directly flush to wall surface.

2. Flush Wall Mounted (Interior Wall Mount Only): Cast studs into back of each letter for mounting to wall. Mount flush to wall surface with no gap behind letters.
3. Bottom Rail Mount (Exterior Canopy Mount): Provide characters with flattened base, and fasten to an aluminum C-channel rail with stainless steel screws. Rail shall have black enamel finish. Provide vertical post supports extending to structural substrate and fasten securely and seal penetrations watertight.

E. Mounting, Plaques:
1. Mount plaques with manufacturer's standard concealed stud method; with anchors recommended specifically for wall/partition substrate structure indicated. Mount plaques flush to wall surface with no gap behind plaques.

F. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION 101400

SECTION 102600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies.

D. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

E. SCAQMD 1168 - Adhesive and Sealant Applications.

1.02 SUBMITTALS

A. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

B. Shop Drawings: Include plans, elevation, sections, and attachment details.

C. Selection Samples: Provide manufacturer's color charts for each product and material requiring color selection.

D. Verification Samples: Submit physical samples, manufacturer's standard size, for each selected color.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.

1. Failures include, but are not limited to, the following:
    a. Structural failures or internal connection failures.
    b. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards **[CG]**:
   1. Construction Specialties, Inc.
   2. Inpro.
   3. Koroseal Interior Products.
   4. Nystrom, Inc.

B. Impact Resistant Chair Rails **[MISC-2]**:
   1. Construction Specialties, Inc.; Dimensional Moldings.
   2. Inpro; Chair Rails.
   3. Substitutions: See Section 016000 - Product Requirements.

C. Impact Resistant Chair Rails **[MISC-3]**:
   1. Construction Specialties, Inc.; Dimensional Moldings.
   2. Inpro; Chair Rails.
   3. Substitutions: See Section 016000 - Product Requirements.

D. Impact Resistant Wall Covering, Type III **[IRWC-1]**:
   1. Inpro; Ricochet.
   2. Momentum; Vantage III.
   3. Substitutions: See Section 016000 - Product Requirements.

E. Impact Resistant Wall Covering, Type III **[IRWC-2]**:
   1. Inpro; Ricochet.
   2. Momentum; Vantage III.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

B. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

2.03 PRODUCT TYPES

A. Impact Resistant Chair Rails **[MISC-1]**: Factory- or shop-fabricated, with preformed end caps and internal and external corners:
   1. **Basis-of-Design:** Construction Specialties; Dimensional Moldings - Feature Rails, Victorian Rail FR-451.
   2. Material: Polyethylene terephthalate (PET or PETG); PVC-free, color as selected from manufacturer's standard colors.
   3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   4. Mounting: Surface.

B. Impact Resistant Chair Rails **[MISC-2]**: Factory- or shop-fabricated, with preformed end caps and internal and external corners:

1. **Basis-of-Design**: Construction Specialties; Dimensional Moldings - Feature Rails, Neoclassic Rail FR-251.
2. Material: Polyethylene terephthalate (PET or PETG); PVC-free, color as selected from manufacturer's standard colors.
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

C. Corner Guards - Surface Mounted **[CG]**:
1. **Basis-of-Design**: Construction Specialties; Acrovyn VA Series.
2. Material: Polyethylene terephthalate (PET or PETG); PVC-free.
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Width of Wings: 1-1/2 inches.
5. Corner: Square.
6. Color: To be selected by Architect from manufacturer's full range.
7. Length: One piece, 8 feet (96 inches) in length.

D. Impact Resistant Wall Covering, Type III **[IRWC-1]**:
1. **Basis-of-Design:** Inpro; Richocet Flexible Wall Protection - Whirlwind.
2. Material: High-impact vinyl.
3. Backing: Heavy poly-cotton knit.
4. Thickness: 0.040 inch.
5. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
6. Color: To be selected by Architect from manufacturer's full range.
7. **Direction: Railroaded.**
8. Accessories: Provide manufacturer's standard color-matched trim and moldings.
9. Adhesive: Type recommended by panel manufacturer; low-VOC compliant.

E. Impact Resistant Wall Covering, Type III **[IRWC-2]**:
1. **Basis-of-Design:** Inpro; Richocet Flexible Wall Protection - Spark.
2. Material: High-impact vinyl.
3. Backing: Heavy poly-cotton knit.
4. Thickness: 0.040 inch.
5. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
6. **Direction: Railroaded.**
7. Accessories: Provide manufacturer's standard color-matched trim and moldings.
8. Adhesive: Type recommended by panel manufacturer; low-VOC compliant.

F. Adhesives and Primers: As recommended by manufacturer.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

2.05 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.
   1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position top of chair rails as indicated on Finish Schedule Elevations.

C. Corner Guards:
   1. Provide corner guards at all outside corners of gypsum board partitions.
   2. **Position corner guards with bottom of guard immediately above top of wall base.**
      a. **Exceptions: At locations where chair rail interrupts continuous run of corner guard to ceiling, break corner guard immediately below rail and continue immediately above chair rail to ceiling.**
   3. Adhesive Installation: Apply continuous beads of adhesive on each leg of corner guard. Use a roller to ensure maximum contact with adhesive.

D. Terminate rails 1 inch short of door openings and intersecting walls.

E. Impact Resistant Wall Coverings:
   1. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
   2. Establish a fixed level line slightly above finished floor, but not exceeding 1 inch, to allow for floor slab variations.
   3. Full-Height Installation: Establish a plumb line located at edge of starting point of first sheet to ensure following sheets will be installed plumb.
   4. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
   5. Adhesive Installation: Apply adhesive using trowel to an area of wall surface that can be completed within cure time of the adhesive. Use a roller to ensure maximum contact with adhesive.
   6. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement. Place trim on panel before fastening edges, as required by manufacturer's installation instructions.
   7. At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project. Remove excess sealant after paneling is installed and prior to curing.
   8. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 102600

SECTION 102800
TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

E. ASTM C1036 - Standard Specification for Flat Glass.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

I. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.03 SUBMITTALS

A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

C. Maintenance Data: For each type of accessory, to include in maintenance manual per Section 017800 - Closeout Submittals. Include list of replacement parts and service recommendations.

1. Special Tools: Furnish one security Torx head screwdriver to Owner for use with security fasteners.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:

1. American Specialties, Inc.
2. Bobrick Washroom Equipment.
3. Bradley Corporation.

B. Under-Lavatory Pipe Supply Covers:

1. Plumberex Specialty Products, Inc.

2. Truebro; IPS Corporation.

C. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide 6 master/universal keys, minimum, to Owner.

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
   1. Provide mechanical attachment of all accessories. Use of adhesive or double-side tape is not acceptable.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 TOILET ACCESSORIES SCHEDULE, GENERAL

A. General: The following products make reference to the designations indicated on the Toilet Accessories Schedule, Toilet Assemblies, and toilet room plans on the drawings; herein designated as "TA-x".

2.05 COMMERCIAL TOILET AND BATH ACCESSORIES

A. Grab Bars (TA-A, B, & C): Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Finish: Satin.
      d. Length and Configuration: As indicated on drawings.
      e. Products:
         1) American Specialties, Inc.; 3700 Series.
         2) Bobrick Washroom Equipment, Inc.; B-5806 Series.
         3) Bradley Corporation; 832 Series.

B. Toilet Paper Dispenser (TA-D): Roll-in-reserve type, designed to allow automatic activation of reserve roll when needed, or manual activation by pressing release bar, surface-mounted, stainless steel unit with pivot hinge, tumbler lock.
   1. Products:
      a. American Specialties, Inc.; Model 20030.
      b. Bobrick Washroom Equipment, Inc.; Model B-4288.
      c. Bradley Corporation; Model 5402.

C. Sanitary Napkin Disposal Unit (TA-E): Stainless steel, surface-mounted, self-closing door, with full-length stainless steel piano-type hinge, removable receptacle.

1. Products:
    a. American Specialties, Inc; Model 20852.
    b. Bobrick Washroom Equipment, Inc.; Model B-270 Contura.
    c. Bradley Corporation; Model 4781-11.

D. Soap Dispenser (TA-F): Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and vertical stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
1. Minimum Capacity: 40 ounces.
2. Products:
    a. American Specialties, Inc.; Model 0347.
    b. Bobrick Washroom Equipment, Inc.; Model B-2111.
    c. Bradley Corporation; Model 6562.

E. Mirrors (TA-G): Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Size: As indicated on Drawings.
3. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
4. Products:
    a. American Specialties, Inc; 0600 A Series.
    b. Bobrick Washroom Equipment, Inc.; Model B-290.
    c. Bradley Corporation; Model 780.

F. Corner Grab Bar Assembly (TA-H): Stainless steel, smooth surface.
1. Stainless-Steel Nominal Thickness: 0.05 inch.
2. Finish: Satin.
3. Mounting: Concealed with manufacturer's standard flanges and anchors.
4. Outside Diameter: 1-1/4 inches unless otherwise indicated.
5. Configuration: Single "L" shaped shower grab bar.
    a. Length (Control Wall): 32 to 34 inches from wall to centerline of return.
    b. Length (Back Wall): Nominal 18 inches from wall to centerline of return. Limit leg length so as not to interfere with folding shower seat.
6. Products:
    a. American Specialties, Inc.; Model 3774.
    b. Bobrick Washroom Equipment, Inc.; Model B-6861 (1-1/2 inches OD).

G. Folding Shower Seat (TA-J): Wall-mounted surface; welded tubular seat frame, structural support members, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped seat.
1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of manufacturer's standard color.
2. Size: ADA Standards compliant.
3. Products (L-Shaped - 33" to 34.5" wide, reversible):
    a. American Specialties, Inc.; Model 8206.
    b. Bobrick Washroom Equipment, Inc.; Model B-5181.
    c. Bradley Corporation; Model 9569.

H. Shower Rod & Curtain (TA-L): Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for concealed mounting.
   1. Products:
      a. American Specialties, Inc; Model 1204.
      b. Bobrick Washroom Equipment, Inc.; Model B-6047.
      c. Bradley Corporation; Model 9539.
   2. Shower Curtain: Provide shower curtain with each shower curtain rod.
      a. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
      b. Size: Provide curtain width 6 inches wider than shower opening dimension for 36 inch showers, and 12 inches wider than shower opening dimension for 48 inch and larger showers. Provide curtain height sized to 2 inches less than curtain rod mounting height.
      c. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
      d. Color: White.
      e. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

I. Combination Towel Dispenser/Waste Receptacle (TA- M): Recessed with projecting waste receptacle, stainless steel; seamless wall flanges, continuous piano hinges, tumbler locks on upper and lower doors.
   1. Waste receptacle liner: Provide with manufacturer's reusable, molded plastic liner accessory with stainless steel support strap. Bobrick "LinerMate" or equivalent.
   2. Towel dispenser capacity: 800 multi-fold; 600 C-fold.
   3. Waste receptacle capacity: 12 gallons.
   4. Products:
      a. American Specialties, Inc; Model 0469.
      b. Bobrick Washroom Equipment, Inc; Model B-3944.
      c. Bradley Corp; Model 234.

J. Folding Wall Mounted Bench (TA-L): Wall-mounted; tubular stainless steel frame and structural support members, with either angled wall brace that slides and locks into position or with swing down legs; all framing components, hinges, and mechanical fasteners of Type 304 stainless steel. Provide rectangular seat, 42 inches wide by 20 inches deep. Mount with top of bench at 18 inches above finish floor.
   1. Load Capacity: Minimum live load capacity of 500 lbs.
   2. Seat: Phenolic composite seat slats with natural teak finish; or fully natural teak slats.
   3. Products:
      a. Teakworks4u; ADA Compliant Folding Transfer Bench; TBF2-420200W.
      b. Versable Designs; Teak Stainless Steel ADA Folding Dressing Bench.

K. Robe Hook: Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish. Provide one centered on interior face of door of all single-user toilet rooms and one adjacent to each shower, unless otherwise indicated on Drawings; verify final mounting locations with Architect in field.
   1. Products (Double-Prong):
      a. American Specialties, Inc.; Model 7345.
      b. Bobrick Washroom Equipment, Inc.; Model B-6727.
      c. Bradley Corporation; Model 9124.

2.06 SECURITY/DETENTION TOILET ACCESSORIES

A. Security Mirrors: With embedded back plate.
   1. Basis-of-Design Product:
      a. Jails Correctional Products; Model J-1-0530E.
   2. Construction:
      a. Mirror frame shall be 12-3/8 inches by 16-3/8 inches, fabricated from 16 gauge cold finished steel, with 5/16 inch inner and outer flanges and having a tensile strength of not less than 53,000 pounds per square inch. Frame to have natural finish, chromium plated.
      b. Mirror opening shall be 10 inches by 14 inches, made of 0.031 inch sheet steel, polished to a high degree of reflectivity, and chromium plated.
      c. Include eight (8) chromium plated, security type, flat head machine screws, 1/4 inch diameter of proper length for use in backer plate.
   3. Embed Back Plates:
      a. Provide steel 3/8 inch embed plates and 11 gauge anchor tabs as detailed and/or required by the mirror manufacturer (refer to details on Drawings).

B. Security Grab Bars, Anti-Ligature:
   1. Products:
      a. Acorn Engineering Co.; 1109 Series.
      b. Bradley Corporation; SA70 Series
      c. Jails Correctional Products; J-1-7000 Series.
   2. Construction:
      a. Tubing: Provide 18 gauge, type 304 stainless steel, satin finish.
      b. Flanges: Minimum 11 gauge stainless steel, welded to bar.
      c. Closure Plate: 11 gauge stainless steel welded to underside of bar.
   3. Provide embed plate, drilled and tapped for security fasteners, with anchor straps.
   4. Locate Grab Bars to comply with accessibility codes and as indicated on Drawings.

C. Security Toilet Accessory Anchorage: Provide security fasteners, anchorage inserts, and other accessory products as required to anchor all security/detention accessories for a complete tamperproof installation, per the following:
   1. Exposed Security Fasteners:
      a. Provide Torx-head (star with center reject pin) security fasteners for anchoring work in exposed security areas.
      b. Finish shall match that specified of the item anchored.
      c. Provide special tools for fastening devices.

2.07 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
   1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
   2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
   3. Construction: 1/8 inch flexible PVC.
      a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
      b. Microbial and Fungal Resistance: Comply with ASTM G21.
   4. Color: White.

5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
6. Products:
   a. Plumberex Specialty Products, Inc; Plumberex Trap Gear.
   b. Truebro; IPS Corporation; Lav Guard 2.

2.08 BABY CHANGING STATIONS

A. Baby Changing Station (TA-K): Wall-mounted folding baby changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
   1. Material: Polyethylene.
   2. Mounting: Surface.
   3. Color: As selected.
   4. Minimum Rated Load: 250 pounds.
   5. Products:
      a. American Specialties, Inc; Model 9014.
      b. Bradley Corp; Model 9632.
      c. Diaper Deck & Co.; Diaper Deck.
      d. Foundations Worldwide; Classic Horizontal Wall Mounted Changing Station
      e. Koala Kare Products, Div. of Bobrick; KB300.
      f. Safe Strap Company, Inc; Diaper-Depot Basic.

2.09 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder (TA-T): 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch diameter.
   2. Hooks: Three, 0.06 inch stainless steel rag hooks at shelf front.
   3. Mop/broom holders: Four spring-loaded rubber cam holders at shelf front.
   4. Length: 36 inches.
   5. Products:
      a. American Specialties, Inc; Model 1315-4.
      b. Bobrick Washroom Equipment, Inc.; Model B-224 x 36.
      c. Bradley Corporation; Model 9984.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated on Drawings.

3.03 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 102800

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide.

B. NFPA 10 - Standard for Portable Fire Extinguishers.

C. UL (DIR) - Online Certifications Directory.

1.02 SUBMITTALS

A. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and trim and door panel styles.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

C. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.03 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

B. Coordinate rough opening sizes to ensure cabinet locations meet ADA mounting requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers and Cabinets:
   1. Activar Construction Products Group, Inc. - JL Industries.
   2. Amerex Corporation.
   3. Ansul, a Tyco Business.
   4. Babcock-Davis.
   5. Badger Fire Protection.
   6. Buckeye Fire Equipment Company.
   7. Fire-End & Croker Corporation.
   8. Kidde, a unit of United Technologies Corp.
   9. Modern Metal Products; Div of Technico.
   10. Larsen's Manufacturing Co.
   11. MOON American.
   12. Nystrom, Inc.
   13. Oval Brand Fire Products.
   14. Potter-Roemer.
   15. Pyro-Chem, a Tyco Business.
   16. Strike First Corporation of America.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: 4-A: 60-B:C.
   2. Size: 10 pound.
   3. Finish: Baked polyester powder coat, manufacturer's standard color.

C. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
   1. Class: K type.
   2. Size: 1.6 gallons.
   3. Finish: Manufacturer's standard polished stainless steel.

2.03 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction, General:
   1. Formed cold-rolled steel sheet; minimum 0.036 inch thick base metal.
   2. Size to accommodate extinguisher(s) and accessories indicated.
   3. Provide cabinet enclosures with right angle inside corners and seams, and with formed perimeter trim and door stiles.

B. Cabinet Configuration: Semi-recessed type.
   1. Trim Type: One piece trim and door frame, returned to wall surface. Rolled edge trim; 2-1/2- to 3-inch depth as standard with manufacturer.
   2. Available Products (Non-Rated): One of the following, or comparable product by manufacturer from list above:
      a. J.L. Industries/Activar; Ambassador C1017.
      b. Larsen's Manufacturing Co.; Model 2409-6R.
      c. Potter-Roemer; Alta Model 7023.

C. Doors: Minimum 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with continuous piano hinge.
   1. Door Glazing Style: Vertical duo, configuration as standard with manufacturer.
   2. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

E. Operating Hardware: Manufacturer's standard for cabinet type; continuous door hinge allowing 180 degree opening, with ADA-compliant door latch either surface mounted or flush inset into door panel, with cam or friction latch operation.

F. Fabrication: Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated or baked-enamel finish.

B. Lettering: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, pre-spaced lettering in accordance with authorities having jurisdiction (AHJ).
   1. Apply vertically to door of fire extinguisher cabinets, and apply to wall surface at bracket mounted extinguishers.

2.05 EMERGENCY KEY ACCESS BOX

A. Commercial Door Key Access Box: Provide fire department emergency key access box manufactured by The Knox Company; as required by local Fire Marshal. Provide Knox Box recessed mount 3200 Series, nominal 4 inches by 5 inches by 3-1/4 inches deep, with tamper switch and recessed mounting kit. Provide manufacturer's standard polyester powder coat finish in black color. No substitutions will be considered. Coordinate recessed installation with substrate construction, electrical connections as required for proper operation, and with requirements of local Fire Marshal. Contact Knox Company: www.knoxbox.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, no greater than 48 inches from finished floor to top of handle.

C. Install mounting brackets at 44 inches above finish floor.

D. Secure rigidly in place.

E. Place extinguishers and accessories in cabinets and on wall brackets as applicable.

F. Install cabinet and extinguisher signage.

G. Adjust cabinet doors after installation to ensure smooth operation.

3.03 PROTECTION AND CLEANING

A. Protect fire extinguishers, fire extinguisher cabinets, and accessories from damage until Substantial Completion.

B. Provide touchup to damaged finishes; replace items that cannot be satisfactorily repaired or refinished.

END OF SECTION 104400

SECTION 105113
METAL LOCKERS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Where indicated, coordinate with Section 033000 - Cast-in-Place Concrete to provide 4-inch high concrete bases with embedded anchors or grounds as required for locker attachment.

1.03 SUBMITTALS

A. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.

B. Shop Drawings: Indicate locker plan layout, numbering plan.

C. Samples: Submit manufacturer's color charts illustrating full range of available colors.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide 2 year manufacturer warranty for materials and workmanship. Complete forms in Owner's name and register with manufacturer.

1. Warranty shall cover failures including material and finish failure and faulty operation of latches, hinges, or other hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Heavy-Duty Metal Lockers:

1. Basis-of-Design: Steele Solutions; Tiffin Duty Bag DLK24247203HNAB.
2. Spacesaver; Gear Lockers.
3. Penco Products, Inc; Rapid Response Duffel Lockers.

2.02 LOCKER APPLICATIONS

A. Gear Lockers: Metal lockers, mounted to wall and concrete base.

1. Width: 24 inches.
2. Depth: 24 inches.
3. Height: 72 inches.
4. Configuration: Three tier; 24-inch by 24-inch nominal compartments.
5. Ventilation: Provide with louvers or punched/perforated diamond pattern on front of door panel.

6. Locking: Padlock hasps, for padlocks provided by Owner.
7. Provide sloped tops.
8. Color: To be selected from manufacturer's full range by Architect.

2.03 METAL LOCKERS

A. Accessibility: Design a minimum of 5% of units as 'accessible' to comply with ICC A117.1 and ADA Standards.
   1. Quantity: Provide not less than one ADA-compliant locker for every 20 total. Locate ADA lockers at end of locker run with clear access space.
   2. Shelf shall be no lower than 15 inches above floor.
   3. Provide ADA-compliant recessed handle and latch, no higher than 48 inches above floor.
   4. Provide 3" x 3" aluminum plate logo with the international symbol of accessibility on each ADA-compliant locker.

B. Locker Case Construction:

C. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
   1. Where ends or sides are exposed, provide flush panel closures.
   2. Provide filler strips where indicated, securely attached to lockers.
   3. Color: To be selected by Architect . Manufacturer's standard neutral color is acceptable for locker interiors.

D. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
   1. Body Construction: Fabricated of minimum 16 gauge, 0.0598 inch steel sheet.
   2. Reinforced Bottoms: 16 gauge, 0.0598 inch minimum with channel edge; welded to frame panels, with manufacturer's standard stiffeners.

E. Doors: Channel edge; welded construction, manufacturer's standard stiffeners, grind and finish edges smooth.
   1. Door Thickness: 16 gauge, 0.0598 inch, minimum.
   2. Form recess for operating handle and locking device.

F. Latches and Door Handles: Manufacturer's standard.
   1. Latching: Manufacturer's standard for locking arrangement selected.
      a. Multi-Point Lift Handle Gravity Latch: Pocket-mounted, provide two-point latching for two-tier locker doors and three-point latching for single-tier locker doors.
         1) Handle Pocket, Recess: Stainless steel flush-mounted cup recessed into face of door.
         2) Handle: Steel finger lift mechanism with exposed portion encased in molded plastic trigger.
            (a) Padlock Eye: Integral with lift trigger, sized for use with 9/32 inch diameter padlock shackles.
         3) Latching Mechanism: Spring activated nylon slide latch enclosed in steel latch channel allows closing of door while padlock or built-in lock is in position.
         4) Provide resilient silencers secured to door stops for silent operation.

G. Hinges: Continuous piano hinge with powder coat finish to match locker color.

H. Sloped Top: 18 gauge, 0.0478 inch minimum, with closed ends.

I. Filler Panels, End Closures and Trim: 18 gauge, 0.0478 inch, minimum.

J. Number Plates: Provide oval shaped aluminum plates. Form numbers of block font style with ADA designation, in contrasting color.

2.04 BENCHES

A. Benches (Locker Room and Shower Room): Stationary type; bench top of laminated birch or maple; painted steel pedestals.
   1. Height: 17-1/2 inches to top of bench; at all benches.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
      a. Accessible Bench Dimensions: 42 inches wide by 20 inches deep, minimum.
      b. Thickness: 1-1/4 inch thick.
   3. Pedestals: Tubular steel, with mounting flanges welded to each end; fixed to floor.
      a. Pedestal Finish: Powder coat; match locker exterior finish color.
      b. Fasteners: Provide with manufacturer's standard fasteners for securing benchtop to pedestals, and provide concrete expansion/wedge anchors for anchorage to floor slab. Provide all anchors with heads color-matched to pedestals.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors and grounds are properly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers plumb and square.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

E. Bolt or rivet adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, and sloped tops.

G. Install fittings if not factory installed.

H. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION 105113

SECTION 105113.13
METAL EVIDENCE LOCKERS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate blocking, furring, wall reinforcing, embedded anchors, and other associated work to confirm adequate support is provided for attachment of lockers.

1.03 SUBMITTALS

A. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

B. Shop Drawings: Indicate locker plan layout, numbering plan.

C. Selection Samples: Submit manufacturer's color charts illustrating full range of available colors.

D. Verification Samples: Submit physical samples, manufacturer's standard size, for each selected color.

E. Installer's qualification statement.

F. Maintenance Data: Provide manufacturer's data for operable locker doors; including adjustment, repair, and replacement of locker doors and latch and lock assemblies.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Furnish 20 additional complete lock assemblies for Owner's maintenance use.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified; authorized representative of manufacturer for installation and maintenance of the units required for this Project.

B. Source Limitations: Provide all evidence lockers from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage with protective coverings. Do not remove protective coverings until ready to install.

B. Store evidence lockers in a dry, enclosed space. Do not install until installation spaces are enclosed, interior finishes in installation spaces are completed, and spaces are conditioned at occupancy conditions.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide 4 year manufacturer warranty for materials and workmanship on welded evidence lockers. Complete forms in Owner's name and register with manufacturer.

1. Warranty shall cover failures including material and finish failure and faulty operation of latches, hinges, or other hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Evidence Lockers:
   1. Spacesaver Corporation; Secure Evidence Lockers **(Basis of Design).**
   2. Tiffin Metal Products; Evidence Lockers.
   3. Fasco Security Products; Police Evidence Lockers.
   4. Southwest Solutions Group; Police Evidence Lockers.

2.02 LOCKER APPLICATIONS

A. Evidence Lockers: Pass-through metal evidence lockers, mounted to wall and concrete base.
   1. Width: 36 inches and 24 inches, as indicated.
   2. Depth: 24 inches.
   3. Height: 78 inches, with 4 inch integral base (82 inch total nominal height).
   4. Configurations: Multiple configurations shall be required. Refer to basis-of-design models below and elevations on drawings for layout and size of each compartment with unit. Final desired configurations shall be confirmed with Owner during shop drawing/submittal phase prior to furnishing.
      a. Spacesaver E (Quantity 4): 14.5 inch wide by 18.5 inch high unit.
      b. Spacesaver A (Quantity 1): 32.5 inch wide by 37 inch high unit.
      c. Spacesaver N (Quantity 2): 8.5 inch wide by 74.75 inch high unit.
      d. Spacesaver T (Quantity 6): 8.5 inch wide by 18.5 inch high unit.
      e. Spacesaver W (Quantity 6): 8.5 inch wide by 18.5 inch high unit; 12 total compartments.
   5. Locking: Keyed with key drop. Key remains in unlocked locker until user deposits evidence, locks locker, removes key, and places key in that unit's key drop. Authorized evidence manager with master key retrieves evidence and resets locker to unlocked position.

2.03 METAL EVIDENCE LOCKERS

A. Lockers: Factory assembled, made of cold-rolled formed sheet steel, ASTM A1008/A1008M, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
   1. Where ends or sides are exposed, provide flush panel closures.
   2. Provide filler strips where indicated, securely attached to lockers.
   3. Color: To be selected by Architect. Manufacturer's standard neutral color is acceptable for locker interiors.

B. Locker Body: Formed and flanged; with steel stiffener ribs; all-welded.
   1. Tops, Sides, and Shelves: 16 gauge, 0.0598 inch minimum.
   2. Backs: 18 gauge, 0.0478 inch minimum.
   3. Reinforced Bottoms: 16 gauge, 0.0598 inch minimum with channel edge; welded to frame panels, with manufacturer's standard stiffeners.

C. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
   1. Door Frame: 16 gauge, 0.0598 inch, minimum.

D. Doors: Channel edge; welded construction, manufacturer's standard stiffeners, grind and finish edges smooth.
   1. Door Thickness: 16 gauge, 0.0598 inch, minimum.

E. Hinges: Heavy duty, 5- or 7-knuckle type; two for doors under 42 inches high; three for doors over 42 inches high.

F. Filler Panels, End Closures and Trim: 18 gauge, 0.0478 inch, minimum.

G. Number Plates: Provide oval shaped aluminum plates. Form numbers of block font style, in contrasting color.

H. Locks: Keyed with key drop. Provide manufacturer's standard keyed locks, each compartment keyed differently, with master keying of all units on the Project. Provide 6 master keys.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors and grounds are properly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers plumb and square.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

E. Bolt or rivet adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, and sloped tops.

G. Install fittings if not factory installed.

H. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION 105113.13

SECTION 105613
METAL STORAGE SHELVING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI MH28.1 - Multi-Level Shelving Systems Utilizing Industrial Grade Steel Shelving.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Rated uniform shelf loads.
   2. Details of shelving assemblies, including reinforcement.
   3. Accessories.

B. Shop Drawings: Indicate location, type, and layout of shelving, including lengths, heights, and aisle layout, and relationship to adjacent construction.
   1. Indicate methods of achieving specified anchoring requirements.

C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged units.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Four Post Shelving:
   1. Hallowell
   2. List Industries, Inc
   3. Montel
   4. Penco Products, Inc
   5. SpaceSaver Corporation.
   6. Tennsco Storage
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 SHELVING - GENERAL

A. General: All shelving shall comply with ANSI MH28.1.

B. See drawings for layout and sizes.

C. Anchors: Provide anchoring hardware to secure each shelving unit to floor and wall.
   1. Provide hardware of type recommended by manufacturer for substrate.
   2. Wall Anchorage: Provide manufacturer's standard "Z" shape wall mount system, fabricated of two L-angles back to back, and fastened together with two nuts and bolts. Anchorage of post directly to wall is not acceptable. Prior to wall attachment, install foot plates at base of all posts and shim or adjust to achieve level and plumb installation.

2.03 FOUR POST SHELVING

A. Four Post Shelving: Steel post-and-shelf type with sway bracing, shelving brackets, shelving surfaces, and accessories as specified.
   1. Unit Sizes: Refer to Drawings for locations for each required size.
      a. 36 inches wide by 18 inches deep. (Penco basis-of-design: Model 1H7026)
      b. 42 inches wide by 18 inches deep. (Penco basis-of-design: Model 1H7056)
      c. 48 inches wide by 18 inches deep. (Penco basis-of-design: Model 1H7086)
      d. 48 inches wide by 24 inches deep. (Penco basis-of-design: Model 1H7096)
   2. Shelf Capacity: 800 lb for 36 inch wide units, 600 lb for 42 inch wide units, and 500 lb for 48 inch wide units.
   3. Adjustability of Shelving: Continuous along length of post (1 inch centers).
   4. Shelves per Unit: 6 shelves total; top, bottom, and 4 intermediate.
   5. Unit Height: 84 inches, nominal. (Penco basis-of-design is 87 inches high)
   6. Finish: Baked enamel, medium gloss.
   7. Color: To be selected by Architect from manufacturer’s full range.

B. Posts: Formed sheet members; perforations exposed on face of members are not acceptable.
   1. Metal Thickness: Manufacturer's standard for shelf quantity and loading requirements.
   2. Connecting Hardware: Manufacturer's standard.
   3. Post Bases: Flat steel foot plate, with manufacturer’s recommended adjustable leveling device; pre-drilled for floor anchors.

C. Bracing: Formed sheet members.
   1. Back Sway Bracing: Strap type; at back of each unit.
   2. Side Sway Bracing: Strap type; at each side of each unit.
   3. Strap Sway Bracing: Two straps crossed diagonally, of manufacturer's standard steel sheet thickness; welded, riveted, or bolted to uprights.

D. Shelves: Formed sheet, finished on all surfaces.
   1. Metal Thickness: 18 gauge, 0.0478 inch, minimum.
   2. Shelf Edge Profile: Extending 3/4 inch, maximum, below top surface of shelf.
   3. Shelf Connection to Posts: Manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is level and that clearances are as specified.

B. Verify that walls are suitable for shelving attachment.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor and reinforce as specified, as indicated on drawings, and as recommended by manufacturer.
   1. Anchor to floor with floor anchors, secured through pre-drilled floor plates.
   2. Shim and adjust floor plates prior to installation of wall anchors.
   3. Anchor to wall with manufacturer's standard "Z" shape wall mount system.

C. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.

D. Out-Of-Square Tolerance - Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.04 CLEANING

A. Clean shelving and surrounding area after installation.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 105613

SECTION 105626
MOBILE STORAGE SHELVING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ISO 9001 - Quality Management Systems — Requirements.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. System components.
   2. Accessories.
   3. Substrate preparation instructions and recommendations.
   4. Storage and handling requirements and recommendations.

B. Shop Drawings: Indicate location, type, and layout of mobile storage shelving system, including lengths, heights, and aisle layout, and relationship to adjacent construction.
   1. Indicate location and configuration of rails.
   2. Indicate method of installation and configuration for shelving mounted on carriages.
   3. Provide location and details of anchorage devices to be embedded in or fastened to the structure.

C. Selection Samples: For each finish product specified, provide color chips representing manufacturer's full range of available colors and finishes.

D. Manufacturer's Qualification Statement.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, ISO 9001 certified for quality control standards for design, production, and installation of complete high density storage system assemblies.

B. Installer Qualifications: Company specializing in performing the work of this section; certified or authorized by manufacturer for installation of specified products.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged components.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade, in an enclosed, weatherproof location.

1.05 FIELD CONDITIONS

A. Field Measurements: Verify field measurements for locations of mobile storage shelving before preparation of shop drawings and before fabrication to ensure proper dimensions, clearances, and installation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.01 MOBILE STORAGE SHELVING SYSTEMS - GENERAL

A. System Description: High-density movable shelving system consisting of shelving units mounted on rail-guided wheeled carriages.
   1. Carriage Operation: Mechanically assisted.
   2. Carriage Capacity: 1000 pounds per lineal foot.
   3. Rail Mounting: Surface mounted directly on floor without grout, plywood, or shims.
   4. System Layout: Refer to Drawings, and to Shelving Size Schedule below. Size carriages and system to manufacturer's standards to accommodate shelving units required.
   5. Overall System Height: Nominal 84 inches.

B. Accessibility Requirements: Comply with ADA Standards.

C. Components:
   1. Carriages: Rectangular steel frames of type and size required for selected system.
      a. Provide one fixed end carriage and the remainder movable carriages at each system. Fixed end carriage shall be anchored to rails. Exposed back panel of fixed carriage shall match construction and finish of other exposed panels.
      b. Carriage frames shall be steel and shall be welded or bolted. Galvanized components and riveted construction are unacceptable.
      c. Finish: Powder coat paint; color to match shelving.
   2. Wheels: Cold rolled steel; dual flanged.
   3. Rails: Cold rolled steel; type and size to carry loads imposed by system.
   4. Anti-Tip Device: Provide manufacturer's standard rail device to prevent tipping of system.
   5. Shelving Units: Provide manufacturer's standard four-post steel shelving that integrally interlocks into carriage. Provide shelving with 6 levels (bottom shelf and 5 intermediate shelves) and dividers every 12 inches (provide one divider at 24- and 30-inch wide shelving units, and two dividers at 36-inch wide shelving units).
      a. Shelving Size Schedule:
         1) Shelving at Fixed Carriage:
            (a) 36 inch wide by 15 inch deep (single-sided) shelving.
         2) Shelving at Movable Carriages:
            (a) 36 inch wide by 30 inch deep (two-sided) shelving.
   6. Floor Panels: Underlayment grade plywood, 3/4 inch thick.
   7. Ramps: Steel; 4.76 degrees maximum slope (do not exceed 1:12 for accessibility compliance).
      a. Do not exceed 1/8 inch vertical lip where ramps transition to adjacent finish floor.
   8. Floor Covering: Coordinate with flooring installer to provide vinyl tile to match adjacent flooring in the space. Coordinate to ensure flooring installation does not affect operation of system.
   9. Face Panels: High pressure laminate over particleboard core; full height and width of shelving.
      a. Color: To be selected from shelving manufacturer's full range of available options

D. Accessories:

1. Anchors and Leveling Screws: Types and sizes recommended by manufacturer for specified rail mounting and floor system.
2. Bumpers: Manufacturer's standard rubber stops.
3. Label Holders: Manufacturer's standard type, attached to face panel at end of each shelving unit.

2.02 MECHANICALLY ASSISTED MOBILE STORAGE SHELVING SYSTEMS

A. Basis of Design: Spacesaver; Mechanical Assist High Density Mobile Storage System.

B. Other Acceptable Manufacturers:
   1. Borroughs Corporation; Aisle-Saver; Synergy Series.
   2. Montel; Mobilex Mechanical Assist Storage.
   3. Substitutions: See Section 016000 - Product Requirements.

C. Drive System: Provide uniform movement of the carriage without drifting or jerking.
   1. Chain and sprocket system with full length torque resistant steel shaft.
   2. Provide two wheels per rail for each carriage, direct-driven on one side.

D. Control: Three-spoke operating handle with manual locking latch.
   1. Minimum Gear Ratio: 1 lbf to move a load of 6000 lbs.

E. Safety System: Mechanical safety brake at toe level the full length of the carriage. Light pressure of 1.5 lbf on aluminum bar activates safety mechanism to stop carriage movement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify that substrate is in proper condition to install rails and flooring system per manufacturer's requirements.
   1. Do not begin installation until concrete floor slabs are fully cured and prepared, finishes in the space are complete, and the space is conditioned at occupancy levels.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. General: Install system components and accessories in accordance with manufacturer's printed instructions.

B. Position system components level and plumb within manufacturer's specified tolerances.

C. Anchor rails directly to concrete subfloor.

D. Extend rails under stationary shelving units.

E. Position carriages ensuring wheels align properly on rails. Fasten multiple carriages together forming a single movable base.

F. Install shelving with shelf surfaces level and vertical supports plumb; fasten to carriage supports with vibration-proof fasteners.

3.03 ADJUSTING

A. Adjust mobile storage shelving components and accessories to provide for smooth operation of system.

3.04 CLEANING

A. Clean shelving and surrounding area after installation.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Location: At project site.

3.06 PROTECTION

A. Protect installed system from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 105626

SECTION 107300
PROTECTIVE COVERS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

E. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

F. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

1.02 SUBMITTALS

A. Metal Product Data: Product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, footings, anchorage, size and type of fasteners, accessories and locations.

1. Shop drawings shall be project specific; manufacturer's standard details are not acceptable.
2. For protective covers indicated to attach to the building, include detail showing project-specific wall attachment detail that will transfer structural loads to the primary structural element of the exterior wall.

C. Selection Samples: Manufacturer's color charts for metal components.

D. Verification Samples: Manufacturer's standard size physical samples, representing actual material and finish of exposed metal, for each color selected by Architect.

E. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

F. Designer's qualification statement.

G. Specimen warranty.

1.03 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide standard 1-year warranty covering all material deterioration, structural failure, and installation defect.

C. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of factory-applied finishes. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design (Building Mounted): Mapes Architectural Products; Super Lumideck - Hanger Rod.

B. Basis-of-Design (Column Supported): Mapes Architectural Products; Post Supported Walkway Canopy.

C. Acceptable Comparable Manufacturers:
   1. Architectural Fabrication, Inc.
   2. Dittmer Architectural Aluminum.
   3. Mitchell Metals.
   4. Perfection Architectural Systems, Inc.
   5. Superior Mason Products, LLC.
   6. Tennessee Valley Metals.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 PROTECTIVE COVERS - GENERAL

A. Design Criteria: Design and fabricate to resist gravity, wind, snow, ponding water, weather exposure, seismic, and other structural loads without failure, damage, or permanent deflection in accordance with ASCE 7, applicable building code, and as indicated on Drawings.
   1. Structural Design:
      a. Post-Supported: Coordinate foundations and footing design with Division 3 Section "Cast-in-Place Concrete" and with Structural Drawings.
      b. Building-Mounted: Provide engineered wall anchorage system capable of transferring structural loads to the structural CMU wythe or structural cold-formed steel framing (CFSF-S) of the exterior wall assembly. Do not support protective covers directly from brick veneer or other non-structural exterior claddings.
   2. Thermal Movement: Design protective covers to accommodate thermal movement caused by ambient temperature range of 120 degrees F and surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

B. Configuration: Column layout, dimensions, clearances, and design as indicated on drawings.
   1. Drainage Concept (Post Supported): Water collected in decking conducted into perimeter drain beams and discharged through columns. Design drainage system to discharge water at grade level with internal diverter plates and cutouts in column sidewalls Discharge water either at grade level with diverter plates and column cutouts, or coordinate with subdrainage installer for connection into underground subdrainage system, as indicated on Drawings.
   2. Drainage Concept (Building-Mounted): Water collected in decking shall run to rear of protective cover into aluminum fascia/channel. Provide 2-inch diameter drain hole at one end of protective cover, with 3-inch by 3-inch downspout fabricated of smooth extruded aluminum. Downspout shall be fastened to wall with straps at minimum 60 inch on center. Downspouts shall drain on grade with splash block or into underground drainage, as indicated. Downspout and wall straps shall be finished to match protective cover.

C. Provide a complete system ready for erection at project site.

D. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.03 PROTECTIVE COVERS - ASSEMBLY

A. Description: Flat top metal framework with metal covering supported by metal columns or hanger-rod assembly, as indicated.

B. Column Anchorage: Column embedded in concrete footing. Provide column sleeves or Styrofoam blockouts for presetting into concrete formwork.

C. Framework: Aluminum.

D. Covering Materials:
   1. Manufacturer's standard interlocking extruded aluminum decking modules.

2.04 COMPONENTS

A. Components for Post-Supported Protective Covers:
   1. Columns: Extruded aluminum; minimum wall thickness of 0.125 inch.
      a. Type: Box tube column.
      b. Cross-Section: 4 inches by 4 inches (per basis-of-design), unless otherwise indicated, or unless larger column size is required due to structural engineering analysis.
      c. Grout Key: Provide two 1-1/2 inch diameter holes on opposite sides in column base.
   2. Beams: Extruded aluminum; minimum wall thickness 0.125-inch.
      a. Style: U-shaped drain beams.
      b. Beam Depth: 7 inches (per basis-of-design), unless otherwise indicated, or unless larger size is required due to structural engineering analysis.
      c. Beam Width: Match nominal dimension of column width as required to allow for manufacturer's standard attachment method.
   3. Extruded Aluminum Decking: Self-flashing, interlocking sections; minimum 0.078-inch thick.
      a. Deck Profile: Manufacturer's standard deck section for corrugated soffit profile; size deck depth for structural spacing indicated.
   4. Fascia: Extruded aluminum; height per manufacturer's standard profile; minimum 0.070-inch thickness.
   5. Wall Attachment for Cantilever Type Post-Supported Canopies: Provide threaded rod anchors, extending fully through exterior wall. Provide integral eyebolt, "U" bracket, or manufacturer's standard clevis assembly at rod attachment anchors for hanger rod attachment. At all through anchors, provide galvanized steel compression sleeves, sized to wall cavity and cladding depth, and additional construction as needed to prevent transferring structural loads onto veneer/cladding. All loads shall transfer to structural "backup" wall.
      a. The structural system above is per the Basis-of-Design product indicated. Manufacturer may submit an alternate pre-engineered structural system, provided the system complies with other requirements of this section and is capable of supporting loads from the primary wall structure.

B. Components for Building-Mounted Protective Covers:
   1. Beams: Extruded aluminum.
      a. Style: I-shaped beams; 3-1/4" x 3-1/4" x 1/4" nominal.
   2. Extruded Decking: Self-flashing, interlocking sections, minimum 0.078-inch thick.
      a. Deck Profile: Manufacturer's standard deck section for corrugated soffit profile; size deck depth for depth of protective cover as indicated.

3. Fascia: Extruded aluminum; height per manufacturer's standard profile; minimum 0.125-inch thickness.
4. Hanger Rod Assembly: Manufacturer's standard 1-inch diameter hanger rod assembly, fabricated of schedule 40 galvanized steel. Provide aluminum clip angle bolted to aluminum I-beams for attachment of hanger rod assembly to canopy, with neoprene washers or other material standard to manufacturer for separation of dissimilar metals.
    a. Wall Attachment: Provide threaded rod anchors, extending fully through exterior wall. Provide integral eyebolt, "U" bracket, or manufacturer's standard clevis assembly at rod attachment anchors for hanger rod attachment. At all through anchors, provide galvanized steel compression sleeves, sized to wall cavity and cladding depth, and additional construction as needed to prevent transferring structural loads onto veneer/cladding. All loads shall transfer to structural "backup" wall.
        1) The structural system above is per the Basis-of-Design product indicated. Manufacturer may submit an alternate pre-engineered structural system, provided the system complies with other requirements of this section and is capable of supporting loads from the primary wall structure.

C. Exposed Framing Fasteners: Flush countersunk stainless steel screws or bolts; consistent with design of system and acceptable to manufacturer.
    1. Decking Fasteners: Stainless steel with neoprene washers.
    2. Finish exposed fasteners to match metal framing.

D. Flashings: Metal and finish matching system framing components, with thickness as recommended by manufacturer for conditions encountered.

E. Reinforcement Materials and Bracing: Where light fixtures, dimensional letter signage, or other items are indicated to be mounted to the protective cover, provide additional reinforcing or bracing elements to ensure a secure attachment to the protective cover without failure of decking or structural elements. Coordinate with submitted manufacturer(s) of items to be mounted to protective cover for loading requirements and attachment methods.

2.05 MATERIALS

A. Aluminum:
    1. Aluminum Extrusions: Alloy and temper 6063-T5, 6063-T6, or 6061-T6 members complying with ASTM B221 (ASTM B221M), with minimum thickness 1/8 inch for structural members and 1/16 inch for nonstructural members.

B. Concrete for Footings: Refer to Division 3 Section "Cast-in-Place Concrete."

C. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
    1. Grout: Comply with ASTM C1107/C1107M.

D. Bituminous Coating: ASTM D 1187 asphaltic coating or comparable protective coating to prevent corrosion between materials. Building felt is not acceptable.

2.06 FABRICATION - METAL COMPONENTS

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Provide notches, cut outs, and internal deflectors in members as noted to act as internal water drainage system.

D. Weld aluminum members in accordance with AWS D1.2/D1.2M.

E. Exposed Fastenings: Unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of framing. Fabricate anchors and related components of same material and finish as framing, except where specifically noted otherwise.

G. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

H. Accurately form components to suit each other and to building structure.

2.07 FINISHES

A. High Performance Organic Coatings: AAMA 2604, multiple coats, thermally cured fluoropolymer system.

B. Finish Color: To be selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and site area for conditions that might prevent satisfactory installation.

B. Verify that foundation, electrical utilities, and placed anchors are in correct position.

C. Verify that bearing surfaces are ready to receive this work.

D. Do not proceed with installation until conditions are satisfactory.

3.02 PREPARATION

A. Supply items required to be cast into concrete with setting templates for installation of work in other sections.

B. Concrete Foundations/Footings: Coordinate with and provide column sleeves or Styrofoam blockouts to the concrete installer to ensure foundations comply with manufacturer's requirements.

3.03 INSTALLATION - FRAMING

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Post Supported Canopies: Anchor columns in concrete foundations with column sleeves or preset Styrofoam blockout locations. Insert columns into foundation space and fill remaining annular space between concrete and columns with non-shrink cementitious grout. Wipe off surplus anchoring material, provide 1/8-inch build up at column and slope smoothly away from column. Seal anchoring material when required by grout manufacturer's installation instructions.

D. Building Mounted Canopies: Provide threaded anchor assemblies required for connecting framing to structure. Anchor framing to primary structural wall elements. Where primary structure of exterior wall is cold-formed steel framing (CFSF-S metal studs), provide additional fire-retardant treated wood blocking between metal stud members to accommodate hanger rod spacing.

E. Protective Coating: Provide a protective coating to separate aluminum surfaces from masonry, concrete or cementitious materials, and dissimilar metals.

3.04 INSTALLATION - METAL COVERING

A. Install in accordance with manufacturer's instructions.

B. Fasten metal decking to metal support members, aligned level and plumb.

C. Install fascia panels, trim, and flashing.

D. Separate dissimilar metals using concealed bituminous paint.

E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.05 TOLERANCES

A. Maximum Variation from Plumb, Level, or Line: 1/8 inch per 10 feet, or 3/8 inch total in overall dimension.

B. Alignment of Two Adjoining Members Abutting in Plane: Within 1/16 inches.

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean all exposed surfaces after installation.

3.07 PROTECTION

A. Touch-up, repair, or replace damaged components before Date of Substantial Completion.

B. Protect protective covers after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION 107300

SECTION 107500
FLAGPOLES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

D. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles.

1.02 SUBMITTALS

A. Product Data: Provide data on pole, accessories, and configurations.

B. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

C. Designer's Qualification Statement.

1.03 QUALITY ASSURANCE

A. Designer Qualifications: Design flagpole assemblies, including foundations, under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. American Flagpole & Flag Co.
   2. Baartol Co., Inc.
   3. Concord American Flagpole.
   4. Eagle Mountain Flag and Flagpole.
   5. Eder Flag Manufacturing Co., Inc.
   6. Morgan-Francis Flagpoles & Accessories.
   7. Pole-Tech Co, Inc.
   8. Substitutions: See Section 016000 - Product Requirements.

2.02 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001.
   1. Material: Aluminum.
   2. Design: Cone tapered.

3. Mounting: Ground mounted type.
4. Nominal Height: 25 feet for state and municipality flag and 30 feet for U.S.A. Flag; heights shall be measured from nominal ground elevation.
5. Quantity and Nominal Heights: As indicated on Drawings; heights shall be measured from nominal ground elevation.
6. Halyard: External type.
   a. Provide one halyard at each flagpole.
   b. Snap Hooks: Provide two snap hooks per halyard; fabricated of brass.

B. Performance Requirements:
1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

2.03 POLE MATERIALS

A. Aluminum: ASTM B241/B241M, 6063 alloy, T6 temper; minimum wall thickness of 3/16 inch.

2.04 ACCESSORIES

A. Finial Ball: Aluminum, 6 inch diameter.

B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.

C. Cleats: 9 inch size, aluminum with galvanized steel fastenings, one per halyard.

D. Halyard: 5/16 inch diameter nylon, braided, white.

2.05 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth as indicated on Drawings.

2.06 FINISHING

A. Metal Surfaces in Contact With Concrete: Protect with bituminous/asphaltic coating.

B. Concealed Steel Surfaces: Galvanized to ASTM A123/A123M requirements.

C. Aluminum: Mechanical finish; medium satin directionally textured (AA-M32).

D. Finial: Spun finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole and fittings in accordance with manufacturer's instructions.

B. Electrically ground flagpole installation with ground spike and plate.

C. Fill base around foundation tube sleeve with concrete specified in Section 033000.

D. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.

E. Fill foundation tube sleeve with sand and compact.

F. Seal around top of foundation tube sleeve with two inches of elastomeric sealant.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard functions smoothly.

END OF SECTION 107500

SECTION 108213
EXTERIOR GRILLES AND SCREENS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

F. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

G. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data indicating material product types and characteristics, including thicknesses,

B. Shop Drawings: Submit detailed shop drawings, indicating component profiles, sections, finishes, fastening details, special details, and manufacturer's technical and descriptive data.

C. Samples: Submit manufacturer's standard color charts for color selection.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's original, unopened packaging, with labels clearly identifying manufacturer and material.

B. Store materials indoors, protected from moisture, humidity, and extreme temperature fluctuations.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a one year period after Date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Exterior Aluminum Grilles and Screens:
   1. Basis-of-Design: MetalTech Global; PixArt Perforated Panels.
   2. Amico Architectural Metals; Picture PERFect.

3. Metalwerks; Screenwalls (custom).
4. Zahner Company; ImageWall.
5. Substitutions: See Section 016000 - Product Requirements.

2.02 SCREENS

A. Aluminum Screens: Provide shop fabricated, shop finished, custom designed screens assembled into panels.
   1. Screen Type: Perforated metal sheet. Pattern shall be custom designed and fabricated by taking image of police officer badge (image shall be provided by Architect/Owner) and converting to perforated metal pattern using different sized circular perforations.
   2. Aluminum Sheet Thickness: 1/8-inch.
   3. Panel Size and Configuration: As indicated on drawings.
   4. Anchorage: Provide for projected mounting with 1-inch long stainless steel spacers/standoffs and masonry sleeve anchors with gasketed heads. Provide fasteners in corners and equally spaced around perimeter; do not exceed 16 inch on center spacing. Fastener heads shall be finished to match panel finish color.
      a. Manufacturer's standard anchorage system is acceptable as an alternate to above anchorage; system shall provide for approximate 1 to 2 inch projection from wall surface and system shall be finished to match panels.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M) alloy 6063, temper T5, 1/8 inch minimum wall thickness.

B. Aluminum Sheet: ASTM B209/B209M alloy 5005, with temper as required for forming.

2.04 FABRICATION

A. Shop fabricate grilles and screens to the greatest extent possible.

B. Disassemble as necessary for shipping and handling, clearly mark units for proper reassembly.

C. Provide supports, anchorages, and accessories as required for complete assembled system.

D. Provide inserts as required for installation into concrete or masonry based support materials.

E. Fabricate grilles to ensure proper fit into openings of sizes indicated, with tolerances for installation.

F. Attach grille panels to each other by welding, unless otherwise indicated.

2.05 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605; multiple coats, thermally cured polyvinylidene fluoride system.

B. Finish Color: As selected by Architect from manufacturer's standard color range.

2.06 ACCESSORIES

A. Fasteners: ASTM F593 stainless steel or ASTM A307 carbon steel, sizes to suit installation conditions.

B. Anchors and Inserts: Corrosion resistant; type, size, and material required for loading and installation as indicated.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that painting, roofing, masonry work, and other adjacent work that might damage grille finish have been completed prior to start of installation.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint, and allow paint to dry prior to installation of aluminum components.

C. Set grilles level, plumb, with uniform joints, and in alignment with adjacent work as indicated.

D. Mechanically secure grilles to supporting structure.

E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

3.03 TOLERANCES

3.04 CLEANING

A. Clean finished surfaces as recommended by manufacturer and maintain clean condition until Date of Substantial Completion.

B. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.05 PROTECTION

A. Protect installed grilles to ensure grilles are without damage until Date of Substantial Completion.

END OF SECTION 108213

SECTION 111516
WEAPONS LOCKERS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of anchorages for weapon lockers and clearing station. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, anchor bolts, and items with integral anchors that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

B. Preinstallation Meetings: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.03 SUBMITTALS

A. Product Data: For each locker product.

B. Samples: Provide manufacturer's color charts indicating range of available finishes.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

1.05 WARRANTY

A. Manufacturer Warranty:
   1. Provide a lifetime manufacturer warranty for welded steel frame lockers.
   2. Provide 5 year manufacturer warranty on hinges and other moving parts.

PART 2 PRODUCTS

2.01 WEAPONS LOCKERS

A. Manufacturers:
   1. Patterson Pope.
   2. Southwest Solutions Group.
   3. Spacesaver Storage Solutions.

B. Handgun Lockers:
   1. Basis-of-Design: Spacesaver Model EDHGF02V.
   2. Configuration: Two (2) door; each compartment nominal interior size 12" W by 6" H.
   3. Nominal Overall Dimensions: 13 inches wide by 14 inches high by 6-1/2 inches deep.

C. Construction: Factory assembled of all welded sheet steel, ASTM A653/A653M, with manufacturer's standard powder coat finish. Each compartment shall be lined with mothproofed felt, neoprene, or nonabsorbing closed-cell padding.
   1. Locker Unit Body: Minimum 14 gauge.
   2. Back: Minimum 16 gauge.
   3. Doors: Minimum 14 gauge front face panel, fitted flush to front of cabinet body to prevent prying open, welded to minimum 16 gauge compartments to hold firearms.

4. Framing: Provide 2 inch by 2 inch by 1/8 inch steel angle frame, fully welded to locker body, prepared for mounting type indicated.

D. Mounting: Recessed in wall.

E. Locks: Each compartment shall have cylinder cam lock, keyed differently and master keyed. Provide one key for each compartment, and two master keys.

F. Finish: Factory powder coated; color to be selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that in-place construction is complete and ready for installation. Verify that in-wall blocking and reinforcement is installed as applicable.

1. For recessed lockers, verify that rough openings are properly sized and located, and ready for installation of lockers.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Install lockers plumb and square.

C. Secure lockers with anchoring devices to suit substrate materials.

3.03 ADJUSTING

A. Adjust doors and latches for smooth operation, without binding. Verify that integral locking devices operate smoothly.

B. Repair or replace components that do not operate smoothly

3.04 PROTECTION

A. Protect installed lockers from subsequent construction operations.

END OF SECTION 111516

SECTION 111910- CUSTOM / SECURITY HOLLOW METAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Swinging detention doors.
   2. Sliding detention doors.
   3. Detention panels.
   4. Detention frames.

B. Detention Equipment Contractor (DEC):
   1. Provide the Custom/Security hollow metal doors, door frames, window frames, and any other security hollow metal (SHM) (also referred to as Detention Hollow Metal (DHM)) components indicated on the contract document drawings, schedules, and specifications.
   2. Provide all necessary embed plates and/or anchors.
      a. Provide galvanized steel embed plates at concrete columns and other concrete construction for anchoring of SHM frames. Coordinate installation of embed plates and other anchorages. Furnish setting drawings, templates, diagrams, and instructions for items to be embedded. Deliver such items to Project site in time for installation.
   3. Coordinate requirements for manual and electric hardware, monitoring and control devices, and SHM manufacturer-provided raceway/cabling junction boxes.
   4. Coordinate all electrical requirements, by the Electrical Contractor, with the Security Control Systems Contractor (SCSC) and electrical contractor.
   5. Schedule installation of this work to coincide with erection of the masonry work on the project so that these contractors can grout fill the custom/security hollow metal frames as their work is erected. The DEC is responsible for providing grout and grout holes for any frames that cannot be delivered and erected by the erection contractors.
      a. Construction Schedule: Provide a separate line for Custom/Security Hollow Metal doors and frames, which shall include adequate time for shop drawing preparation, submittal review, fabrication, and delivery of frames to the project site in time to meet above requirement and requirements of paragraph 3.2.B.2 in "Installation" article ahead. Coordinate with General Contractor.
   6. Provide on-site supervision of the delivery and installation of the custom/security hollow metal doors, frames, and windows.

C. General Contractor:
   1. Take delivery of the custom/security hollow metal doors, door frames, window frames, embedded plates/anchors, and store per manufacturer's recommendations.
   2. Install custom/security hollow metal doors, door frames and interior/exterior window frames, as indicated.
   3. Install all embedded plates and/or anchors, provided by the DEC.

D. Electrical Contractor:
   1. Coordinate electrical requirements with General Contractor and DEC.
   2. Coordinate this work with the control needs of the Security Control Systems Contractor (SCSC).

E. Provide Custom/Security hollow metal work manufactured by a single firm specializing in the production of this type of work.

F. When a fire resistance classification is indicated or scheduled for steel doors and frames, provide fire-rated doors investigated and tested as a fire door assembly, complete with type of hardware to be used. Identify each fire door with recognized testing laboratory labels, indicating applicable fire rating of steel doors.

G. Due to security concerns, no physical U.L. Fire Resistance Labels are to be attached to the door/frame assemblies. Instead, provide die-stamped identification numbers on fire-rated doors and frames and a letter of certification recording these numbers to the Owner/user for his record and files.

H. Fire-Rated Assemblies: Provide door and frame assemblies and window frame assemblies complying with the Virginia Construction Code Building Code and NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Test Pressure: Test at positive pressure according to NFPA 252 or UL 10C. After 5 minutes into the NFPA 252 test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill (per 2018 IBC Section 716.2.1.1]).
   2. Test Pressure: Test according to IBC Section 716.2.1
   3. Smoke and Draft Control Assemblies: Fire door assemblies located in smoke barrier walls shall also meet the requirements for a smoke and draft control door assembly tested in accordance with UL 1784. Installation of smoke doors shall be in accordance with NFPA 105.

I. When a fire resistance classification is indicated or scheduled for steel doors and/or frames containing components that have not been tested as an assembly, the manufacturer shall construct the door and frame components of the assembly in accord with the resistance rating, and certify in writing to the Owner, Enforcing Authority, Contractor, and the Architect that the door and frame components have been constructed in accord with the testing laboratory requirements in lieu of label.

J. Door and Panel Construction
   1. Field Examination:
      a. The Custom/Security hollow metal contractor shall include in his bid the cost to provide one (1) replacement security hollow metal door that is to be selected for field testing.
      b. When directed by the Architect, the Contractor shall destroy a randomly-selected security hollow metal door or panel by sawing it in half.
      c. When examination discloses door construction at variance with the details specified, the door manufacturer shall replace all doors shipped to the project, as of the date of inspection, with doors constructed in conformance with project specifications.
      d. Under conditions of nonconformity, the door manufacturer shall pay for the destroyed door and related labor.

e. When examination proves that the door was constructed in conformance with specifications, the Detention Equipment Contractor (DEC) shall immediately proceed to provide the replacements for the destroyed door.

2. All detention doors and panels for this Contract shall be constructed as specified and to meet the following ASTM Testing.

a. The following tests (ASTM F 1450 – 12a) shall be conducted by an independent testing laboratory, upon doors with documentation attesting to compliance with the detention door construction required and indicated in this section.

1) Doors for these tests shall utilize minimum 14 gauge face sheets, 12 gauge frames, 3 feet by 7 feet (nominal size), not exceeding 225 lbs. in weight, and shall be fabricated as Door Type "DN" without a food pass (refer to Detention Door Types on DrawingsTest A – Door Static Load Test:

a) Door shall be end supported and loaded at quarter points by a total load of 11,000 pounds for a period of one (1) minute. Door shall deflect not more than 0.580 inch (14.73 mm) and shall rebound to within 0.100 inch (2.55 mm) of flatness after the loading is removed.

2) Test B – Door Rack Test:

a) Door shall be secured at one short dimension and support at one other short dimension; unsupported corner shall be loaded for 30 seconds with a load of 5,500 pounds. Results should be as follows: Unsupported corner's measured deflection shall not exceed 3.55 inches (90.52 mm). Rebound to within 1.40 inches (35.7 mm) of flatness with no visual signs of weld failure.

3) Test C - Door Assembly Impact Test:

a) 3'-0" x 7'-0" door, frame, and hardware assembly shall be constructed and rigidly mounted in the vertical position such that the door and locking hardware are operable. The door shall swing on 1-1/2 pair of full mortised butt hinges, and shall be locked using a Southern Steel No. 1070, 1080 or 10120 series lock or equal, with bolt size not to exceed 2 inch high x 3/4 inch wide, and latch throw not to exceed 7/8 inch.

b) A door ram pendulum system, capable of delivering consistent impacts of up to 200 feet lb., shall be constructed such that impacts may be delivered to any area of the assembly. The weight of the ram shall be 80 lb. $\pm$ 0.25 lb. The pendulum ram system shall be positioned opposite the door side of the assembly such that the door swings away from the ram. While hanging at rest, the ram shall be positioned such that the striking nose just touches the target area of the door. The striking nose shall be made from C1010-1020 low carbon steel, the striking surface area of which shall not exceed 4.0 square inches +/- 0.04 square inches.

c) With the door closed and locked and the above testing arrangement secured, the following series of impact tests shall be performed from the push side of the assembly:

Position and Order of Impacts	Number of Impacts	Impact Energy (ft. lbs.)
On door at center line of bolt, 6" from door edge	200	200

On door within 6" of bottom hinge	75	200
On door within 6" of center hinge	75	200
On door within 6" of top hinge	75	200
On the glass within 1.6" of the lower lock edge corner	100	200

d) The door shall remain closed and locked throughout the testing procedure, and the assembly shall not be damaged such that forcible egress can be obtained. After testing is completed, the door shall be capable of being unlocked and operated such that normal egress can be obtained.

4) Test D - Door Edge Crush Test:

a) Door shall be placed in test fixture, hinge side up. Apply pressure perpendicular to door edge until required loads are reached. Remove the door from the framework and place the door back into the test fixture, with the lock side up, and then repeat the test procedure. Required results: Both the hinge edge and lock edge shall support a load of at least 8,000 lbf with a deflection of less than 0.25 inch (6mm).

3. References:
   a. American Society of Testing and Materials (ASTM Standards F1450 and F1592)
   b. National Association of Architectural Metal Manufacturers (NAAMM)
   c. Hollow Metal Manufacturers Association (HMMA Standard 863)
   d. Underwriters Laboratories (UL)

1.3 ACTION SUBMITTALS

A. Required submittal for Custom/Security Hollow Metal Work shall be submitted as a complete package. Failure to do so will result in the submittal being "Rejected" and returned.

B. Manufacturer's Data
   1. Submit one (1) reproducible (digital format) copy of manufacturer's product specifications and installation instructions.

C. Shop Drawings:
   1. Submit one (1) reproducible (digital format) copy of all proposed and/or specified custom security/detention hollow metal work, and elevation layouts.
   2. Include dimensional construction details of each detention frame type, elevations of door and frame design types, conditions at openings, fastener, anchorage, and reinforcement details. Provide details of lock pockets and factory fabricated accessories, including, but not limited to, food passes and lockable paper passes, location & installation requirements of finish hardware & reinforcements, and details of joints and connections. Provide frame details showing fixed steel detention panels. Provide details of doors, including vertical and horizontal edge details, and metal thicknesses.
   3. Drawings shall use the same plan and elevation numbers as indicated on the contract document drawings.

D. Certificates:
   1. Manufacturer shall submit a certificate, individually dated and signed by hollow metal manufacturer, certifying that all materials meet specification requirements.

2. Welder certificates signed by Contractor certifying that welders comply with requirements (Section 4 of ANSI/AWS D1.3) specified under "Quality Assurance" article.

E. Sustainability Submittals: Refer to Division 1 Section "Sustainable Design Requirements."

F. Owner's Tools

1. Furnish five (5) security fastener tools for each different type of security fastener, being utilized, at the time of Substantial Completion.

1.4 JOB CONDITIONS

A. Hardware Coordination Conference: Refer to Finish Hardware and Security Hardware Specification Sections.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle hollow metal work per manufacturer's requirements.

1.6 GUARANTEE

A. Upon Final Completion, the Manufacturer/Installer shall provide a written warranty covering the custom / security hollow metal work against defective materials and workmanship and guaranteeing satisfactory operation and performance for a period of one (1) year after Final Completion. The Manufacturer/Installer shall make necessary adjustments and replace any defective or broken parts caused by defective mechanical parts.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS OF CUSTOM/SECURITY HOLLOW METAL:

A. Manufacturers should submit evidence of successful detention facility experience within the last five years, and a list of projects of scope comparable to or larger than this project completed within the last five years, with Owner, Architect, and General Contractor contact names and telephone numbers.

1. Claborn Manufacturing Co.; Hartselle, AL
2. Trussbilt (Trussbilt/American); Vadnais Heights, MN
3. American Steel Products (Trussbilt/American); Swainsboro, GA
4. Titan Steel Door, LLC; Gainesville, GA

2.2 MATERIALS

A. FERROUS METALS

1. Metal Surfaces, General: For hollow metal work exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
2. Steel Plates, Shapes, and Bars: ASTM A 36.
3. Uncoated Structural Steel Sheet:

a. Provide sheet steel types (manufacturing method), quality, and grade, as follows:
   1) Cold-Rolled Structural Steel Sheet: ASTM A1008/ A1008M, or as noted or required for loading.
   2) Hot-Rolled Structural Steel Sheet: ASTM A1011/ A1011M, unless otherwise noted or required for design loading rolled.

4. Uncoated Steel Sheet: Commercial quality, cold-rolled steel sheet, ASTM A 366.
5. Hot-Rolled Steel Sheet: ASTM A 1011.
6. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, CS (Commercial Steel), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.
7. Gray Iron Castings: ASTM A 48, Class 30.
8. Malleable Iron Castings: ASTM A 47, grade 32510.
9. Brackets, Flanges and Anchors: Metal to match material and finish of supported rails, or as noted.
10. Concrete Inserts: Threaded or wedge type; galvanized ASTM A 47 malleable iron or ASTM A 27 cast steel castings. Provide ASTM A 153 hot-dip galvanized bolts, washers, and shims as required.
11. Welding Rods and Bare Electrodes: Select as per AWS specifications for the metal alloy to be welded.
12. Fasteners: General: Provide Torx–head (star design with center reject pin) security fasteners for anchoring work in exposed security areas. Provide one hundred (100) additional security glazing stop fasteners.
13. Shop Primer for Ferrous Metal (alkyd based): Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645. If the Shop Primer described above is provided instead of the Phenolic-Phosphate based water primer described in item No. 13 below, then all interior surfaces of the hollow metal frame assembly's jambs, heads and sills are to receive a coating of water based coating of Aqueous Automotive Corrosion Control Coating Terotex No. 895213 by Henkel Surface Technologies (or equal).
14. Shop Primer for Ferrous Metal: Interior doors and frames shall be thoroughly cleaned, degreased, bonderized, and provided with one coat of North American Technologies No. 40-P-1802 (or equal) primer.
    a. PRIMER Specifications:
       1) Phenolic Water Based Primer
       2) Product Number: 40-P-1802
       3) Description: Phenolic phosphate based water primer designed for use in extremely corrosive building applications.
       4) Application: Apply by brush, roller, spray, or dip.
       5) Percent solids per weight: 50 percent +/- 2
       6) Weight/Gallon; 8.93
       7) PVC: 39 percent
       8) Gloss 60 degree: 0 degree
       9) Salt Spray: 200 hours @ 1.5m

10) Recommended Film Thickness: 0.8 – 1.5m
11) Color: Gray or Beige
12) Rust Inhibitive Pigment: Zinc Phosphate
13) Application Use: Primer shall be used over properly cleaned, rust free steel for proper rust inhibition. Steel should be stored in a dry environment, protected from damage to surface. Steel must be top coated within one (1) month of arrival with any commercially available top coat, water based or solvent based.

2.3 FABRICATION

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas on exposed traffic surfaces.

F. Weld corners and seams continuously to comply with AWS recommendations and 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Torx-head flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

I. Shop Assembly:
   1. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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. Cut, reinforce, drill, and tap fabricated work as indicated to receive finish hardware, screws, and similar items.
   2. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Accurately form metal to required sizes and profiles as indicated on drawings.

3. After fabrication, interior and exterior doors and frames shall be thoroughly cleaned, degreased, bonderized, and provided with one coat of shop primer.
4. Fabricate exterior doors, panels, and frames from galvanized sheet steel.
5. Clean, treat, and paint exposed, galvanized surfaces of fabricated hollow metal units.

J. Finish Hardware and Security Items Preparation:
1. Templates for all hardware attachments and security items shall be provided by the hardware suppliers to the Detention Equipment Contractor (DEC) for transmittal to the frame and door manufacturer.
2. Fabricate frames with mitered corners, welded continuously and ground smooth. Frames and doors shall be mortised, reinforced, machined, and prepared for all hardware.

2.4 DETENTION METAL DOORS

A. Provide hollow metal doors of the types and styles indicated on the drawings and schedules. Furnish detailed accessory items such as food pass.

B. All hollow metal doors shall have a flush closed top edge and bottom edge.

C. Size/Thickness/Type: Refer to Detention Door Schedule and Detention Door Types.

D. Gauge: 14 gauge face sheets.

E. Coordinate electric hardware requirements to be integrally built into the door with the hardware requirements

F. Internal Core Construction: Provide one of the following two (2) types:
1. Steel-Stiffened Core: Steel stiffened by continuous vertically formed steel hat sections, which upon assembly, shall span the full thickness of the interior space between door faces. Stiffeners shall be 16 gauge (minimum) to meet the performance standards established in the quality control section of this specification, spaced such that the vertical interior webs shall be no more than 4 inches o.c. and securely fastened to both face sheets and together by spot welds spaced a minimum of 2-1/2 inches o.c. vertically. Spaces between stiffeners shall be filled with 3 lbs./cu. ft. fiberglass or mineral Rockwool batt–type material.
2. Truss-Stiffened Core: Continuous, inner–reinforcement full height and width shall be true truss design with triangular form, the shape of which cannot be altered without changing the length of the sides. Flat apexes shall be resistance spot welded on 2-3/4 inch centers horizontally and 3 inch centers vertically. Each flute of reinforcement to be fire and sound insulated with 6 lbs./cu. ft. Rockwool batt-type material.

G. Top and Bottom Channels: The top and bottom edges shall be closed with a continuous channel, not less than 12 gauge, welded to both face sheets at a minimum of 4 inches o.c. Reinforce the top closing end channel with an additional 12 gauge flush closing channel full width continuously welded to the vertical edge of the door at all four corners and at the center.

H. Vertical Edges:
1. All vertical edges shall be reinforced by a continuous steel channel, not less than 12 gauge, extending the full length of the door. Continuously weld and finish smooth edge seams without visible joints or seams on exposed faces or stile edges.
a. For single-acting swinging detention doors, lock and hinge edges shall be beveled 1/8 inch in 2 inches.
b. For sliding detention doors, square both vertical edges.

I. Exterior Doors:
   1. Fabricate exterior doors of two outer, galvanized, stretcher-leveled, steel sheets. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges, except around glazed or louvered panel inserts. Provide weep hole openings in the bottom of exterior doors to permit the escape of entrapped moisture.

J. Interior Doors.
   1. Fabricate interior doors of two outer, cold-rolled, stretcher-leveled, steel sheets. Construct doors with smooth, flush surfaces, without visible joints or seams on exposed faces or stile edges.

K. Finish Hardware Reinforcement:
   1. Hinges: Steel plate 3/16 inch thick by full height, secured by spot–welds 4 inches o.c.
   2. Mortise Locksets and Dead Bolts: 3/16 inch thick steel sheet, welded to inside of door on detention side (cell side) and 3/16 inch thick steel lock mounting plate, beveled at edges, applied to the surface of the door with security screws.
   3. Cylinder Locks: 12 gauge steel sheet, secured with not less than 2 spot–welds.
   4. Flush Bolts: 12 gauge steel sheet, secured with not less than 2 spot–welds.
   5. Surface–Applied Closers: 12 gauge steel sheet, secured with not less than 6 spot–welds.
   6. Push Plates and Bars: 16 gauge steel sheet (except when through bolts are indicated or specified), secured with not less than 2 spot–welds.
   7. Automatic Door Bottoms: Reinforce for mortise–type units with 12 gauge steel, and 16 gauge for surface–applied units.
   8. Vision Panels: 12 gauge steel sheet around perimeter, welded 3 inches o.c. field installed.

L. Removable glass stops shall consist of 10 gauge "Z"-type stops securely fastened to the door using Torx-head (star with center reject pin) security screws of the size, strength and spacing necessary to satisfy impact performance criteria.

2.5 DETENTION METAL FRAMES

A. Provide custom/security hollow metal door frames of the types and styles indicated on the drawings and schedules, interior and exterior. Conceal all anchorage, unless noted otherwise.

B. Provide custom/security hollow metal frames for windows, transoms, side lites, borrowed lites, and other openings as indicated on the drawings, interior and exterior. Conceal all anchorage, unless noted otherwise.

C. Provide galvanized frames at exterior locations and as indicated in the Detention Door Schedule.

D. Fabricate frames with mitered corners continuously welded through head inside corner and miter ground smooth.

E. All frames shall be provided with approved jamb anchors (4 per jamb minimum), floor knees, plaster boxes (26 gauge steel minimum), removable angle spreaders, and door silencers (3 Glynn Johnson GJ64 silencers minimum per door) by the manufacturer. Continuous floor anchors below glazing shall be 12 gauge minimum with holes for fasteners at 12 inches on center.

F. Types: Refer to Detention Door Schedule and Detention Frame Elevations.

G. Gauge: 12 gauge.

H. Finish Hardware Reinforcement: Reinforce frames for required finish hardware, as follows:

1. Hinges and Pivots: Hinge Reinforcing Steel plate 3/16 inch thick by 2 inches wide by 10 inches long welded to the inside of the frame and a Back-Up Angle 3/16 inch thick welded to the Hinge Reinforcement steel plate and to the frame at both its ends. Back-Up Angle shall be drilled and tapped to accommodate security screws to fasten the security hinges.
2. Strike Plate Clips: Steel plate 3/16 inch thick by 1-1/2 inches wide by 3 inches long.
3. Surface–Applied Closers: 12 gauge steel sheet, secured with not less than 6 spot–welds.
4. Provide lock pockets as indicated and required.

I. Removable glass stops shall consist of 10 gauge angles securely fastened to the frame using Torx–head (star with center reject pin) security screws of the size, strength and spacing necessary to satisfy impact performance criteria. During shipment of these assemblies, non–security fasteners may be substituted to hold glass stops in place. The security fasteners shall be included in the same shipment but packaged separately for protection until used to stop in the required glazing.

J. Provide grout openings for all vertical or horizontal hollow metal frame sections that are not accessible for grouting due to steel lintels or other obstructions.

K. Provide separate conduit systems for door control, intercom, etc., within hollow metal frames.

L. Coordinate rabbet width between fixed and removable stops with glass or panel type and installation type indicated.

2.6 DETENTION HOLLOW METAL PANELS

A. Provide fixed detention panels of same materials, construction, and finish as specified for detention doors.

2.7 ELECTRICAL REQUIREMENTS

A. Custom/security hollow metal fabricator shall furnish and install junction boxes and conduit between junction boxes in door frames for electric locks, door position switches, emergency release buttons, and intercom call stations; coordinate special hardware requirements with the Electrical Contractor and Security Hardware Subcontractor.

B. Refer to the Detention Door Schedule(s), Security Hardware Specification Section, and Details.

2.8 SECURITY/DETENTION EQUIPMENT ACCESSORIES

A. Provide accessories, anchorage inserts, and security fasteners for a complete, tamperproof installation.

B. Exposed Security Fasteners:

1. Provide Torx–head (star design with center reject pin) security fasteners for anchoring work in exposed security areas. Provide one hundred (100) additional security glazing stop fasteners.
2. Finish shall match that specified of the item anchored.
3. Provide three (3) sets of tools for each type of security fastener used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which steel doors and frames are to be installed. Notify the Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. Install hollow metal units and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.

B. Placing Frames:

1. Comply with the provisions of S.D.I. 105.
2. Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed and aligned (using metal shims), and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
3. Identify and coordinate with the work of Section 079200 – Joint Sealants to assure the 'Filling of all Voids' around the perimeter of custom/security hollow metal frames. Refer to specification Section 079200 – Joint Sealants and its article on Security Sealants for types of sealants to be utilized.
4. Install fire-rated frames in accordance with NFPA 80.
5. Grout fill solid all custom/security hollow metal frame jambs, sill, and head sections. Provide grout openings in hollow metal frames where access for grout filling of frame sections may be restricted due to steel lintels or other obstructions. Prior to filling jamb, head, and sill frame sections with grout, verify that the required Phenolic Water Based Primer has properly coated all interior surfaces. If the primer coating is omitted or damaged, field apply a coating of the Phenolic Water Based Primer.
6. If the supplied Shop Primer is a universal modified alkyd primer, instead of the Phenolic-Phosphate based water primer, below, then all interior surfaces of the hollow metal frame assembly's jambs, heads, and sills are to receive a coating of water-based coating of Aqueous Automotive Corrosion Control Coating Terotex No. 895213 by Henkel Surface Technologies (or equal).
7. Prior to filling intermediate frame sections with grout, verify that the required Phenolic Water Based Primer has properly coated all interior surfaces. If the primer coating is omitted or damaged, field apply a coating of the Phenolic Water Based Primer.

   NOTE: If the supplied Shop Primer is a universal modified alkyd primer, instead of the Phenolic-Phosphate based water primer, below, then all interior surfaces of the hollow metal frame assembly's jambs, heads and sills are to receive a coating of water based coating of Aqueous Automotive Corrosion Control Coating Terotex No.895213 by Henkel Surface Technologies (or equal).
8. In masonry construction, locate a minimum of four (4) wall anchors per jamb at hinge and strike levels. Setting of anchors and grout filling of frame jambs is specified in Division 4 Sections "Unit Masonry" and "Reinforced Unit Masonry" as applicable.

C. Door Installation:

1. Fit non-fire-rated custom/security hollow metal doors accurately in their respective frames with the following clearance tolerances or as indicated on the Detention Door Schedule (utilize clearances specified in S.D.I. 100 for applications not listed below):
   a. Jambs and Head: 1/8 inch +/- 1/16"

b. Meeting Edges, Pair of Doors: 1/8 inch +/- 1/16"
c. Bottom: 3/8 inch (when no carpet or threshold). When bottom gap exceeds 3/8" at cell doors, provide an accessory steel plate to close the gap to 3/8". Refer to Section 111960 and detail on Drawing A3.3.1.
d. Bottom: 1/8 inch (when having carpet or threshold)

2. Sliding Detention Doors: Fit sliding detention doors in their frames according to manufacturer's written instructions and as required to allow doors to slide without binding.
3. Install fire-rated doors per NFPA 80 (or per local applicable codes, if more stringent).

D. All expenses incurred by the Architect in troubleshooting the Custom / Security Hollow Metal Work, caused by inadequate workmanship or other form of non-performance on the part of the subcontractor, shall be borne by that subcontractor.

3.3 ADJUST AND CLEAN

A. Final Adjustments:
1. Check and readjust operating finish hardware items in hollow metal work immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including detention doors or frames which are warped, bowed, or damaged or otherwise unacceptable.

B. Clean grout and other bonding material off detention doors and frames immediately after installation.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M

D. Prime Coat Touchup:
1. Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
2. After finishing smooth field welds, apply air-drying primer.

END OF SECTION 111910

SECTION 111950 - SECURITY GLASS AND GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. Detention Equipment Contractor (DEC):
   1. Provide security glass and glazing work as indicated.
   2. Applications of security glass and glazing include the following:
      a. Security glazing of interior and exterior doors.
      b. Security glazing of interior and exterior hollow metal frames and miscellaneous interior security glazed frames.
      c. Insulating security glazing in exterior openings.

B. General Contractor:
   1. Coordinate efforts of security glazing with other glazing work and the installation of security hollow metal work.

1.3 GLAZING CRITERIA PERFORMANCE REQUIREMENTS

A. Security Glass:
   1. Comply with multiple impact and high energy impact tests:
      a. UL 972
      b. ASTM F 1233.
      c. ASTM F 1915.

B. Bullet Resistant Glass:
   1. Comply with UL 752. Provide glazing, listed and labeled by UL for the required rating.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated:
   1. Design Procedure for Glass: ASTM E 1300 and ICC's International Building Code.
   2. Design Wind Pressures: As indicated on Drawings.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with Safety Standard for Architectural Glazing Materials; 16 CFR Part 1201, Category II.

E. Security Polycarbonate:
   1. Comply with ASTM F 1233 containment test body passage or contraband passage level as described in Security Glazing "Compositions" section.
   2. Comply with ASTM F 1915 containment test using pendulum impact having blunt, sharp and axe heads with heat /fire (torch) applied.
   3. Bullet resistant products shall be tested and listed by UL 752 or ASTM F 1233, whichever is applicable and certified to by the security glazing manufacturer.
   4. Maintenance serviceability test, all types:

a. Products will not exhibit abrasion haze of more than 15 percent when tested to ANSI Z26.1. Taber Abrader test No. 17 for 100 cycles having a 500 gram load.
b. No extraordinary procedures shall be required for window cleaning. Manufacturer's recommendations shall be followed.

F. Experience Criteria:
1. Minimum of five (5) years' experience manufacturing specified item.
2. Minimum of five (5) years successful installations on detention and correctional facilities.
3. Security glazing manufacturer approval:
a. No security glazing manufacturers will be approved after the bid date. All manufacturers must submit qualifications to the Architect for consideration no less than fifteen (15) days prior to bid date.

1.4 ACTION SUBMITTALS:

A. Required submittals for this section shall be submitted as one complete package. This shall include, but not be limited to, manufacturer's data, shop drawings, and samples. Failure to do so will result in the submittal being "Rejected" and returned.

A. Manufacturer's Data – Glass and Glazing:
1. Submit one (1) reproducible (digital format) copy of manufacturer's specifications and installation instructions for each type of glass, setting blocks, sealants, and gaskets required.
2. Include test data substantiating that glass complies with specified requirements.
3. Indicate by copy of transmittal that Glazier has received copy of handling and glazing instructions.

B. Manufacturer's Data - Glazing Materials:
1. Submit one (1) reproducible (digital format) copy of manufacturer's specifications and installation instructions for each type of glazing, sealant, tape, compound, gasket and associated miscellaneous material required. Include manufacturer's published data, letter of certification, or certified test laboratory report indicating that each material complies with the requirements as is intended generally for the applications indicated.
2. Indicate by copy of transmittal that Glazier has received copy of each glazing component's recommended installation instructions.

C. Sustainability Submittals: Refer to Division 1 Section "Sustainable Design Requirements."

D. Shop Drawings:
1. Submit FULL SCALE hollow metal sill glazing installation detail drawings. Details shall indicate the actual glazing products being supplied (i.e. setting blocks, sealants, gaskets), their actual sizes, their placements/spacing and their dimensional relationships within the assembly.
a. Provide details for fire-rated and non-fire-rated security glazing.
b. Provide details for exterior security glazing.

E. Security Glazing Schedule: List glazing types for each opening and location. Use same designations indicated on Drawings.

F. Glazing Samples: For the following products; 12 inches square, two (2) samples of each type:

1. Type INSG-1.
2. Type INSG-2.
3. Type INSG-3.

G. Shading Film product data and samples: Submit one (1) reproducible (digital format) copy of manufacturer's data and two (2) sets of samples of interior-applied, shading "Films" being considered for glazing types indicated to receive it (refer to Security Glazing types).

H. Sample Warranties: For security glazing.

1.5 JOB CONDITIONS

A. Weather Conditions:

1. Do not proceed with installation of liquid sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for sealant installation.

1.6 WARRANTY

A. Security Glass:

1. Provide Owner a five (5) year guarantee for materials and labor from date of Substantial Completion for all security glazing.
2. Guarantee shall include delamination.
3. The guarantee shall be by the manufacturer, co-signed by the Installer and Detention Equipment Contractor.
4. Manufacturer's warranty on laminated polycarbonate:
   c. Provide written warranty by the manufacturer of mar-resistant laminated polycarbonate agreeing to supply replacement product, FOB point of manufacture, freight allowed to project site, in the event of material failure due to manufacturing defect. Defect shall be defined as edge separation, delamination, breakage or coating failure. Time period for said warranty shall be a minimum of five (5) years.

PART 2 - PRODUCTS

2.1 GLAZING TESTING CRITERIA

A. Security Glazings:

1. Comply with ANSI standard Z–97.1–2009 Safety Glazing Materials Used in Buildings—Safety Performance Specifications and Methods of Test.
2. Comply with and pass UL multiple impact test.
3. Comply with and pass UL high energy impact test.
4. Comply with ASTM F1915 Standard Test Methods for Glazing for Detention Facilities.

B. Security Polycarbonates:

1. Types: Laminated or monolithic polycarbonate sheet shall be extruded sheet, UV stabilized, but when laminated uses a interlayer of 0.030 inch "LR" resin. Material layups

will vary according to manufacturer's requirements to meet constructions listed in Security Glazing Compositions section. Polycarbonate laminates shall have a flexural strength not less than 13,500 psi (ASTM D790, 180 degrees F continuous service temperature). Products must conform to the International Building Code (IBC) as an approved light transmitting plastic with a CC-1 flammability performance rating.

C. APPROVED MANUFACTURERS: (SUBJECT TO COMPLIANCE WITH PERFORMANCE)

1. Global Security Glazing; Selma, AL
2. DLUBAK Corp; Blairsville, PA
3. LTI Group; Pittsfield, MA
4. McGrory Glass; Paulsboro, NJ

2.2 SECURITY GLAZING COMPOSITIONS

A. **Security Insulating-Glass Units:**

1. Provide factory-assembled units, consisting of sealed lites of glazing material indicated separated by a dehydrated interspace, qualified according to ASTM E 2190.
2. **Type INSG-1:** Outdoor lite is made of monolithic glass and indoor lite is made of glass-clad polycarbonate. 1-3/4" inch nominal, Low-E coated clear insulating glass unit; outdoor lite is 1/4" Kind FT (fully tempered) clear float glass with Low-E coating on second surface, 1/2" insulating air space, indoor lite shall be Security Glazing Type SG-11 – refer to 2.2.C.2 below. Low-E coating shall match Glass Type G-2, as specified in Section 088000.
3. **Type INSG-2:** Outdoor lite is made of monolithic glass and indoor lite is made of glass-clad polycarbonate with decorative interlayers. 1-3/4" inch nominal, Low-E coated clear insulating glass unit; outdoor lite is 1/4" Kind FT (fully tempered) clear float glass with Low-E coating on second surface, 1/2" insulating air space, indoor lite shall be Security Glazing Type SG-11 – refer to 2.2.C.2 below. Low-E coating shall match Glass Type G-2, as specified in Section 088000.
   a. Provide STD Color Spandrel facing interior.
      1) G-3 type – 1/4-inch STD Color Spandrel
4. **Type INSG-3:** Outdoor lite is made of monolithic glass and indoor lite is made of glass-clad polycarbonate with decorative color interlayers matching INSG-2 and with a translucent interlayer. Glazing composition shall match INSG-2. (NOT USED)

B. **Polycarbonate Sheet Glazing:**

1. **Type SG-1P** – 3/4 inch nominal, multi-ply clear polycarbonate, ASTM F1915 Grade 1, 60 minute containment rated; Global Security Glazing RC 750 or approved equal. (NOT USED)
2. **Type SG-2P** – 1/2 inch nominal, multi-ply clear polycarbonate, ASTM F1915 Grade 2, 40 minute containment rated; Global Security Glazing MPC 500 or approved equal.
3. **Type SG-3P** - 3/8 inch nominal, multi-ply clear polycarbonate, ASTM F1915 Grade 3, 20 minute containment rated; Global Security Glazing MPC 375 or approved equal. (NOT USED)

C. **Glass Clad Polycarbonates:**

1. **Type SG-10** – 1 inch nominal, 1/8 inch heat strengthened glass, 1/4 inch clear polycarbonate, 3/8 inch clear polycarbonate, 1/8 inch heat strengthened glass, Apply the shading "Film" on the glazing surface away from the inmate occupancy and after the building has received its Certificate of Occupancy. The shading "film" color is to be selected by the Owner under the supervision of the Architect. ASTM F1915 Grade 1, 60 minute containment rated; Global Security Glazing SP028 or approved equal. (NOT USED)

2. **Type SG-10A** – same as SG-10, but with no film. (NOT USED)

3. **Type SG-11** - 15/16 inch nominal, 1/8 inch heat strengthened glass, 1/8 inch clear polycarbonate, 1/4 inch clear polycarbonate, 1/8 inch clear polycarbonate, 1/8 inch heat strengthened glass. ASTM F1915 Grade 2, 40 minute containment rated; Global Security Glazing 2114 or approved equal.

4. **Type SG-12** – (NOT USED)

5. **Type SG-13F** – 1-3/4" nominal thickness; Proprietary multi-layer construction comprised of glass-clad polycarbonate and fire-resistant glass laminate. Apply the shading "Film" on the glazing surface away from the inmate occupancy and after the building has received its Certificate of Occupancy. The shading "film" color is to be selected by the Owner under the supervision of the Architect. 45 minute fire rated, ASTM F1915 Grade 1; Global Security Glazing – Inferno-Lite ULTIMAX 45-SP028-G **or** INFERNOGARD 45-SP028. (NOT USED)

6. **Type SG-14F** - 1-1/8 inch nominal, 1/4 inch wire glass, 1/8 inch clear polycarbonate, 3/8 inch clear polycarbonate, 1/8 inch clear polycarbonate, 1/4 inch wire glass. 45 minute fire rated, ASTM F1915 Grade 1; Global Security Glazing – ICGCP 2416WW. (NOT USED)

7. **Type SG-15F** - 1-1/8 inch nominal, 1/4 inch wire glass, 1/8 inch clear polycarbonate, 3/8 inch clear polycarbonate, 1/8 inch clear polycarbonate, 1/4 inch wire glass. 90 minute fire rated, ASTM F1915 Grade 1; Global Security Glazing – ICGCP 2416WW90. (NOT USED)

8. **Type SG-16F** - 1" nominal, 1/4" wire glass, 1/4" clear polycarbonate, 1/8" clear polycarbonate, 1/4" wire glass. 45 minute fire rated, ASTM F1915 Grade 2; Global Security Glazing – FRP-4540. (NOT USED)

9. **Type SG-17F** – (NOT USED)

10. Type SG-18F – (NOT USED)

11. **Type SG-20** – 1-1/8" nominal, UL 752 Level 3 Bullet Resistant Glazing; Global Security Glazing – SP311.

12. Wire Glass for Glass-Clad Polycarbonates: Provide diamond mesh pattern.

D. **"Shading Film" Manufacturers:**
1. Madico Window Films Madico, Inc.; St. Petersburg, FL (727) 327-2544 or (888) 887-2022
2. Aegis Films, Inc.; Norcross, GA (770) 417-1281
3. LLumar Solar Control Window Film; Bassett, VA (276) 629-1711
4. MaxPro Window Films; Whiteville, NC (877) 573-3456
5. Sun Block, Inc.; Midlothian, VA (804) 379-4123
6. X-RAYZ Window Tinting; Charlottesville, VA (434) 296-0176
7. Vista Window Film/CP Films, Inc.; Martinsville, VA (888) 273-4567
8. Film Technologies International, Inc.; St. Petersburg, FL (727) 327-2544
9. Solar Film; Midlothian, VA (804) 597-0817

2.3 GLAZING SEALANTS/COMPOUNDS

A. Basic Requirements:
1. Provide black exposed glazing materials, unless another color is indicated, or unless another color is selected by Architect from manufacturer's standard colors.
2. Provide hardness of materials as recommended by the manufacturer for the required application and condition of installation in each case.
3. Provide only compounds known (proven) to be fully compatible with surfaces contacted.
4. Provide sealants recommended by manufacturer of glazing type specified.
5. Provide silicone sealant bead along entire glazing perimeter, between glazing and stops (removable and non-removable), installed with a substantial "wash" away from

B. Silicone Rubber Glazing Sealant:
1. Silicon rubber, one part elastomeric sealant, complying with FS TTS001543, Class A. Provide acid–type for porous channel surfaces, and provide non–acid type for porous channel surfaces (where any of the channel surfaces are porous).

C. Butyl Rubber Glazing Tape:
1. Partly vulcanized, self–adhesive, non-staining, elastomeric butyl rubber tape, 98 percent solids, intended for 35 percent compression, non-appreciable deterioration for 3000 hour test in Atlas Weatherometer.

D. One Component Urethane Glazing Sealant:
1. Solvent based, one component polyurethane; compounded specifically for glazing; complying with FS TT200230, Class A, Type 11.

E. Acrylic Latex Glazing Compound:
1. Modified latex rubber and acrylic emulsion polymer, compounded specifically as a glazing sealant with permanent flexibility (non–hardening), non–staining, and non–bleeding.

F. Butyl Rubber Glazing Sealant:
1. Polymerized butyl rubber compound with inert fillers and pigments, solvent based with 75 percent solids, non–sag, tack–free within twenty-four (24) hours, paintable, non–staining.

G. Preformed Butyl rubber Glazing Sealant:
1. Tape or ribbon (coiled on release paper) of polymerized butyl, or mixture of butyl and polyisobutylene, compounded with inert fillers and pigments, solvent based with minimum of 95 percent solids, with thread or fabric reinforcement, tack–free within twenty-four (24) hours, paintable, non–staining.
2. Provide combination type and encased continuous rubber shim, of approximately 50 durometer hardness.

2.4 GLAZING GASKETS

A. Provide glazing gaskets as recommended by manufacturer.

B. Structural Rubber Glazing Gaskets:
1. Neoprene extrusions with injection molded corner units, fabricated into frames, with either integral or separate locking strips (zippers); comply with ASTM C542, black.

C. Molded Neoprene Glazing Gaskets:
1. Molded or extruded neoprene gaskets of the profile and hardness required for watertight construction; comply with ASTM D 2000 designation 2BC 415 to 3BC 620, black.

D. Polyvinyl Chloride Glazing Gaskets:
1. Extruded, flexible PVC gaskets of the profile and hardness shown, or as required for watertight construction; comply with ASTM D 2287.

E. Vinyl Foam Glazing Tape:
1. Closed cell, flexible, self-adhesive, non–extruding, polyvinyl chloride foam tape; recommended by manufacturer for installation of glass, with only nominal pressure in the glazing channel; comply with ASTM D 1667.

F. Glazing Sealants - Materials specifically for polycarbonates:
1. General
b. Provide products and materials of the type indicated and approved for use with the specified security glass polycarbonate products.
c. Comply with recommendations of the manufacturers of each type of glazing material for the storage, installation, and finishing of respective products.
2. Compatibility
a. Install using sealants of proven compatibility with the various surfaces in which they will come in contact with, including all submitted silicones, setting blocks, glazing tape, and edge block materials.
b. Provide sealants of the color specified, or from manufacturer's standard as chosen by the Architect.
3. Materials
a. Silicone sealants shall be single component elastomeric silicone complying with the following:
1) FS TT-S-001543A (COM-NBS), Class A, non-sag.
2) ASTM C 920, Type S, Grade NS, Class 50, Use G for high modulus silicone.
3) DOWSIL 995 Silicone Structural Sealant or equal.
b. Glazing tape shall be pre-formed polyisobutylene butyl sealant, Tremco 440, Tremco Polyshim II, or equal.

c. Setting blocks shall be neoprene or EPDM (70 to 90 durometer) 3 inches to 4 inches long.
d. Edge blocks shall be neoprene, EPDM or silicone (40-50 durometers) and of a size and spaced as to prevent lateral movement.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. Setting Blocks:
1. Neoprene, 7090 durometer hardness, proven compatible with sealants used.

B. Spacers:
1. Neoprene 4050 durometer hardness, with proven compatibility with sealants used.

C. Compressible Backer Rod:
1. Closed cell or waterproof jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 510 psi compression strength for 25 percent deflection.

D. Self–adhesive, Compressible Filler:
1. Closed cell, polyvinyl chloride foam compressible filler, size 1/2 inch thick by full depth of intermediate composite tube section; color–black. Provide with pressure sensitive adhesive on one side for attachment to tube section. Compressible filler as manufactured by Tremco.

E. Cleaners, Primers, and Sealers:
1. Type recommended by sealant or gasket manufacturer.

F. Exposed Security Fasteners:
1. Provide Torx–head (star design with center pin) security fasteners for anchoring work in exposed security areas.
2. Finish shall match that specified of the item anchored. (Do not paint Torx- heads.)
3. Provide three (3) sets of tools for security fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing and glazing channel surfaces, backing, removable stop design, and the conditions under which the glazing is to be performed. Notify the Architect in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the glazing until unsatisfactory conditions have been corrected.

3.2 STANDARDS AND PERFORMANCE

A. Watertight and airtight installation of each piece of glass is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors) without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

B. Protect glass from edge damage during handling, installation and operations of the building.

C. Glazing channel dimensions are intended to provide for necessary minimum bite on the glass, minimum edge clearance and adequate sealant thicknesses, with reasonable tolerances. The Glazier is responsible for correct size for each opening, with the tolerance and necessary dimensions established.

D. Comply with combined recommendations of glass manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are shown or specified, and except where manufacturer's technical representatives direct otherwise.

E. Comply with "Glazing Manual" by Flat Glass Marketing Association except as shown and specified otherwise, and except as specifically recommended otherwise by the manufacturers of the glass and glazing materials.

F. Inspect each piece of glass immediately before installation and eliminate any which have observable edge damage or face imperfections.

G. Unify appearance of each series of lites by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.

H. Cut and install colored (tinted) glass as recommended in "Technical Services Report No. 104" by PPG Industries.

I. All expenses incurred by the Architect in troubleshooting the Security Glass and Glazing work, caused by inadequate workmanship or other form of non-performance on the part of the subcontractor, shall be borne by that subcontractor.

3.3 PREPARATION FOR GLAZING

A. Clean glazing channels and other framing members to receive security glazing, immediately before glazing. Remove coatings not firmly bonded to substrates. Remove lacquer from metal surfaces wherever elastomeric sealants are used.

B. Apply primer or sealer to joint surfaces wherever recommended by sealant manufacturer.

3.4 GLAZING

A. Comply with glass, window, and frame manufacturer's recommendations.

B. Install setting blocks, of proper size, at quarter points of sill rabbet. Set blocks in thin course of the heelbead compound, if any.

C. Glazing shall be set with equal bearing for entire width.

D. Provide spacers inside and out, and of proper size and spacing, for all glass sizes larger than 50 inches, except where gaskets are used for glazing. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

E. Voids and Filler Rods:
   1. Prevent exudation of sealant or compound by forming voids or installing filler rods in the channel at the heel of jambs and head (do not leave voids in the sill channels) except as otherwise indicated, depending on lite size, thickness and type of glass, and complying with manufacturer's recommendations.

F. Do not attempt to cut, seam, nip or abrade glazing which is tempered, heat strengthened, or coated.

G. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

H. Provide silicone sealant bead along entire glazing perimeter, between glazing and stops (removable and non-removable), installed with a substantial "wash" away from the glass, providing a watertight seal from detergents and cleaning solutions.

I. Clean and trim excess glazing materials from the glass and stops or frames promptly after installation, and eliminate stains and discolorations.

J. Specific recommendations for polycarbonate glazing installation:
   1. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6 inches from corner unless otherwise required. Set blocks in thin course of sealant.
   2. Provide spaces inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 inches, except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed tape thickness.
   3. Setting blocks, edge blocks, silicone cap beads, glazing tapes/filler rod installation shall comply with GANA (Glass Association of North America) 2008 Edition standards.
   4. Tapes and gaskets are to be installed slightly protruded so as to eliminate dirt and moisture pockets. Exposed sealants shall form a wash away from the glazing.
   5. Polycarbonate glazing edge engagements shall generally be 1 inch, unless otherwise approved by the Architect and confirmed by the manufacturer.
   6. Expansion allowances for polycarbonate shall generally be 1/16 inch per 12 inches, per 100 degrees F changes in temperature or as approved by the Architect per manufacturer's recommendations.
   7. Polycarbonate installation and fabrication shall comply with the written recommendations of the polycarbonate manufacturer. Copies of aforementioned recommendations shall be furnished to the Architect.
   8. Install all polycarbonates as late as possible in the construction of the facility. Masking should be removed approximately 1 to 2 inches from the edges so as to allow the glazing tape/silicone to come in contact with the polycarbonate.
   9. All polycarbonate lites, exposed to direct sunlight, shall have the masking entirely removed and then securely covered with polyethylene taped to the frames. Failure to remove the masking at this time may result in adhesion of the masking, preventing later removal.
   10. Where wedge shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs, or by proven adhesive, including embedment of gasket tail in cured heel bead.
   11. Glaze units at the building site.

K. Gasket Glazing:

1. Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in the glazing system.

3.5 CURE, PROTECTION AND CLEANING

A. Cure glazing sealants & compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

B. Protect glass from breakage immediately upon installation, by attaching crossed streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass.

C. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during the construction period, including natural causes, accidents and vandalism.

D. Maintain glass in a reasonably clean condition during construction so that it will not be damaged by corrosive action and will not contribute (by wash off) to the deterioration of glazing materials and other work.

E. Polycarbonate materials shall be cleaned using a mild detergent (such as Formula 409and lukewarm water. Use a clean, soft cloth or sponge, rinse well with clean water.

F. Paint splashes can be removed using VM&P Naphtha, isopropyl alcohol or butyl cellosolve, or as otherwise recommended by the glazing manufacturer. Do not use butyl cellosolve in direct sunlight.

G. DO NOT use abrasives, paint scrapers, razor blades, or squeegees on polycarbonate. Benzene, gasoline, acetone, or carbon tetrachloride should not be used on either polycarbonate or mar resistant polycarbonate.

H. Cleaning instruction coordination shall be the responsibility of the general contractor. The glazier manufacturer, painter, and other trades shall be informed of all cleaning instructions.

I. Wash and polish glass on both faces not more than four (4) days before date scheduled for inspections that establish date of Substantial Completion. Comply with security glazing manufacturer's cleaning recommendations. These washing and polishing efforts shall be done by a professional cleaning/custodial firm.

END OF SECTION 111950

SECTION 111960 - SECURITY HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. Detention Equipment Contractor (DEC):
   1. Provide security hardware as indicated in the schedules and as specified herein.
   2. Refer to Detention Door Schedule and door details; Custom/Security Hollow Metal Work Section 111910, and Security Control System Section 285000.
   3. Coordinate Security Hardware installation with electrical requirements provided by the Electrical Contractor.
   4. Make final electrical control hookups at door and control panels.
   5. Coordinate all Security Hardware and electrical control needs required with other subcontractors and their equipment to have it function properly from the remote Security Control Consoles (e.g. overhead doors, architectural passage doors).
   6. Furnish to the General Contractor any security hardware required for installation on Architectural Hollow Metal doors and frames. Provide necessary templates, etc. for installation.

B. General Contractor:
   1. Coordinate installation of security hardware with DEC, Security Control System Contractor (SCSC) and Electrical Contractor.
   2. Install on Architectural doors and frames any required security hardware being provided by the Security Control System Contractor (SCSC).

C. Electrical Contractor:
   1. Coordinate electrical requirements with General Contractor, DEC and SCSC.
   2. Provide all security control wiring, conduit, fittings, back boxes, and junction boxes, as directed by Security Control System Subcontractor.
   3. Provide all power wiring, conduit, fittings, and mortar boxes as required for equipment described within this section.

1.3 ACTION SUBMITTALS

A. Required submittal for Security Hardware shall be submitted as a complete package. Failure to do so will result in the submittal being "Rejected" and returned.

B. Manufacturer's Data:
   1. Submit one (1) reproducible (digital format) copy of product specifications, fabrication and installation instructions for each hardware item used.

C. Shop Drawings:
   1. Shop drawings submittals for Security Hardware shall be submitted as an entire section.

2. Submit one (1) reproducible (digital format) copy of a horizontal hardware schedule, including all miscellaneous items. Give openings by door number and location, manufacturer's names, catalog numbers, keying information, materials, and finish in the scheduling sequence and format as recommended by security hardware manufacturer.
3. The Architect's approval of the hardware schedule will not relieve the Contractor or Supplier of responsibility for errors or omissions that it might contain.
4. A Security Hardware Coordination Conference shall be held and coordinated by the General Contractor after the first Shop Drawing submittal of the Security Hardware. All participants should have at least one (1) week worth of review of this first Shop Drawing submittal and be prepared to comment on its appropriateness for their assigned job efforts.
5. All security keying shall be reviewed with the Owner and approved during the Shop Drawing submittal review meeting.

D. Samples:
1. The Architect will, upon the Owner's direction, have the DEC and his security hardware supplier submit the following samples showing functions, finishes and design of the proposed hardware items. All samples will remain the supplier's property and will be returned to him prior to Project completion.
2. Possible samples to be submitted to the Owner for review and final approval:
   a. One (each) of all lock types listed.
   b. One (each) of all door hardware and accessories listed.
   c. One (each) of all door hardware security fasteners.

E. Samples and Templates:
1. Furnish to manufacturer of hollow metal doors and frames as required for proper reinforcement and preparation of their work.
2. If required, the Hardware Supplier shall furnish physical hardware and backboxes to the door and frame manufacturer for inclusion into door and frame fabrications.

F. Security Keying Chart/ Schedule:
1. Submit a Keying Chart schedule after both the Architect and Owner/User have approved the security keying shop drawings. Refer to articles titled "Cylinders, Keys, and Keying" and "Key Control" near the end of this Section.

G. Sustainability Submittals: Refer to Division 1 Section "Sustainable Design Requirements."

H. Maintenance Manual
1. Submit two (2) bound Maintenance and Repair Manuals, complete with detailed parts drawings, for all manual and energized security hardware products supplied in this section.
2. Provide on-site review of these manuals and spare parts with the Owner's designated representative during training period. Refer to Article 1.6 "Training" ahead.

I. Refer to Specification Section 111900 for additional submittal requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver all items in manufacturer's original packaging. Individually package and carefully mark each item for intended opening and use. Each item complete with all necessary screws, bolts, keys, instructions, and where necessary, installation templates.

B. Storage: Store items off floor in dry area of building out of way of other work in progress. Provide maximum protection against loss and damage.

C. Handling: Handle all items in a manner as to prevent damage.

1.5 GUARANTEE

A. Upon Final Completion, the Manufacturer/Installer shall provide a written warranty covering the security hardware against defective materials and workmanship and guaranteeing satisfactory operation and performance for a period of one (1) year after Final Completion. The Manufacturer/Installer shall make necessary adjustments and replace any defective or broken parts caused by defective mechanical parts.

1.6 TRAINING

A. Provide [one (1) eight-hour day] [two (2) eight-hour days] for training of Owner personnel for maintenance and repair of all security hardware. Training shall be at Owner's convenience prior to Final Completion.

B. Training class and agenda shall include hands-on teaching of repair and maintenance. Contractor shall provide all equipment and tools necessary to conduct training for Owner's personnel.

C. Training shall be conducted by employees of security hardware manufacturer or factory-authorized service representative with over five years of experience maintaining/repairing locks of the type installed in this facility.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Catalog numbers of the first manufacturer listed have been used to establish the quality required. Other manufacturers seeking approval shall do so in writing per General Requirements and shall list exact catalog numbers and description of the items he proposes to furnish:

ITEM				
1.	Hinges	Southern/Folger	Airteq Stanley	Willoughby
2.	Stops	Airteq	Northwest	
3.	Holders, Surface Bolts	Glynn–Johnson	Yale	
4.	Push, Pull	Southern/Folger	Airteq Brink	Willoughby
5.	Thresholds	Pemko	NGP	Zero
6.	Weatherstrip	Pemko	Reese	Zero
7.	Security Locks	Southern/Folger	Airteq Brink	Willoughby

B. Designations: Following abbreviations identify listed manufacturers:

1.	Southern/Folger	Southern/Folger Co.; San Antonio, TX
2.	Airteq	Cornerstone Detention; Montgomery AL
3.	Brink	Brink; San Antonio, TX
4.	Willoughby Locking Systems	Indianapolis, IN
5.	Glynn–Johnson	Glynn–Johnson Corp.; Chicago, IL
6.	Hager	Hager Hinge Co.; St. Louis, MO
7.	Ives	H. B. Ives Div.; New Haven, CT

8.	LCN	LCN-Allegion
9.	NGP	National Guard Products
10.	Northwest	Northwest Specialty Hdwr Inc.; Clackamas, OR
11.	Norton	Norton Closer Div.; Charlotte, NC
12.	Pemko	Pemko Mfg. Co.; Emeryville, CA
13.	Reese	Reese Enterprises; Rosemount, MN
14.	Rockwood	Rockwood Manufacturing Co.; Rockwood, PA
15.	Stanley	Stanley Black & Decker; New Britain, CT
16.	Zero	Zero Weatherstripping; Bronx, NY

2.2 MATERIALS

A. Screws, Fasteners, and Tools:

1. Provide exposed fasteners to match material/finish of item being fastened. Make fastener of the same metal as item fastened, except use plated brass or stainless steel for all aluminum items. Provide twenty (20) spares of each type of fastener used for anchoring hardware.
2. Provide Torx-head (with center reject pin) security fasteners for exposed fasteners on all security hardware, regardless of manufacturer. Furnish six (6) tool holders and six (6) bits for each different size screw. Holders and bits shall be left at the project after fastener installation and become the property of the user.
3. Provide two (2) alignment tools for medium security locks.

B. **Hinges**:

1. Heavy Duty, 4 1/2 FM – ICS:
   a. Series/Manufacturer:
      1) 204 FMSS / Southern Steel Co.
      2) 604 FMCS / Airteq
      3) No.4 1/2"-ICS Prison / Brink
      4) WSH4545K / Willoughby
   b. Description:
      1) Security Grade: ASTM F1758-05(2019) Grade 1.
      2) 4 1/2 x 4 1/2, 3/16" thick leaves.
      3) Cast stainless steel leaves, non-removable stainless-steel pins, stainless steel ball bearings, three knuckle with "HT" hospital tips.
      4) Provide with a 1/2" long steel stud on each leaf.
   c. Provide quantities as follows:
      1) Doors less than 5 feet high - one pair.
      2) Doors over 5 feet to 7 feet 6 inches high - 1-1/2 pairs.
      3) Doors over 7 feet 6 inches high - 2 pair
      4) Doors 3 feet 6 inches wide and over - 2 pairs.
      5) Doors 4 feet 6 inches wide and over – 2-1/2 pairs.

2. Continuous Hinge (Plain Surface Type):
   a. Series/Manufacturer:
      1) 4000 Series / Braun Mfg. Co., Inc. (www.hinge1.com)
      2) Approved Equal
   b. Description:
      1) Hinge Leaf material - Cold Rolled Steel

2) Hinge Pin material - Steel
3) Shapes and lengths and gauges to be custom modified as required and/or as indicated on drawings.
4) Provide quantities as indicated on the drawings and hardware sets.
5) Provide USP primed.

C. **Door Position Switches**:

1. Swing Door Position Switch (Full-Mortise in frame head):
   a. Series/Manufacturer:
      1) 240 CPS/Southern Steel
      2) 6200/Airteq
      3) 201020/Brink
      4) WL1020-0249/Willoughby
   b. Description:
      1) Provide a fully-mortised, door-position indication switch for monitoring the positions of a swinging door. Installed unit must be fully concealed when door is closed, and fit into the header of a standard, 2" high door frame. The track shall be self-concealing as the door is opened. Allow the door to swing a full 180 degrees. Provide a UL-listed, single-pole, double-throw type switch (SPDT), rated for 10 amps @ 125 or 250 VAC. Unit shall indicate "opened" when a 3'-0" wide door moves approximately 3/8" away from its stop. Provide a fine adjustment of the indication switch to compensate for variations in field conditions. Design unit to operate mechanically for a minimum of two million cycles.
2. Magnetic Switch:
   a. Series/Manufacturer:
      1) 200 MRS TB/Southern Steel Co.
      2) 6200/Airteq
      3) 201023/Brink
      4) WL1023-0250/Willoughby
   b. Mortise installation overhead mounting with switch contacts housed in the door frame and actuating magnet mortised into the top of the door.

D. **Security Locks:**

1. Maximum Security – Solenoid Operation: [for exterior doors only; consider replacing with 24 VDC motor locks]
   a. Series/Manufacturer:
      1) 10120AE-2/Southern Steel Co.
      2) 9912S/Airteq
      3) 5026S x MCLH-M/Brink
      4) WLS-1520S/Willoughby
   b. Security Grade: ASTM F 1577 Grade 1.
   c. Frame mounted 115 or 120 VAC, continuous duty solenoid actuated.
   d. Bolt is retracted by an energized solenoid by a push-button at the control panel and remains retracted until door is opened.
   e. Bolt is retracted manually by key from outside and inside or outside only.
   f. Provide galvanized at exterior installations.
   g. Provide interlock feature as required.

h. Internal switches monitor status of bolt.
i. Provide key cylinder extension where keyed both sides.
j. Listed and labeled for use on fire doors.

2. Maximum Security - Motor Operation:
   a. Series/Manufacturer:
      1) 10120AM/Southern Steel Co.
      2) 9924M/Airteq
      3) 5026M x MCLH-M/Brink
      4) WLS-1520M/Willoughby
   b. Security Grade: ASTM F 1577 Grade 1.
   c. Frame mounted [115 or 120 VAC] [24 VDC], continuous duty motor actuated.
   d. Bolt is retracted by energized motor by a push-button at control panel and remains retracted until door is opened.
   e. Bolt is retracted manually by key from outside and inside or outside only.
   f. Provide galvanized at exterior installations.
   g. Provide interlock feature as required.
   h. Internal switches monitor status of bolt.
   i. Provide key cylinder extension where keyed both sides.
   j. Listed and labeled for use on fire doors.

3. Medium Security - Motor Operation:
   a. Series/Manufacturer:
      1) 10300M/Southern Steel Co.
      2) 9424/Airteq [9424 has 1-1/2 hour rating per UL 10B; standard 2" jamb lock]
      3) 9524/Airteq [9524 has 3vhour rating per UL 10B; Strike/Pull plate with factory installed bolt; has fewer features than 9424]
      4) 3520-300 x ____/Brink
      5) WLS-1300M/Willoughby [Willoughby under consideration – this lock received Grade 1 4/16/25]
   b. Security Grade: ASTM F 1577 Grade 1.
   c. Frame mounted 24 VDC high torque gear motor.
   d. Latchbolt retracts when motor is energized and remains retracted until the door is opened.
   e. Mechanically unlocked by key outside and inside or outside only.
   f. Provide keeper with built-in limit switch; internal switches to monitor status of deadlock.
   g. Provide interlock features as required.
   h. Provide key cylinder extension where keyed both sides.
   i. Listed and labeled for use on fire doors.

4. Medium Security – Solenoid Operation [2" jamb lock – solenoid.
   a. Series/Manufacturer:
      1) 10300S/Southern Steel Co. [check mfr. number]
      2) 9424/Airteq [check mfr. number]
      3) 3020 x ____/Brink [check mfr. number]
      4) WLS-1300S/Willoughby
   b. [fill in remainder of information]

5. Maximum Security - Mechanical Operation:
   a. Series/Manufacturer:
      1) 1080A-2/Southern Steel Co.
      2) 5086-K2/Airteq
      3) 7086/Brink
      4) WLS-1780-K2/Willoughby
   b. Security Grade: ASTM F 1577 Grade 1.
   c. Door mounted deadbolt.
   d. Lever tumbler, key outside and inside.
   e. Supply with hollow metal lock mounting, escutcheons, and security screws.
   f. Provide keeper with built-in limit switch where scheduled.
   g. Provide 3/4-inch throw latchbolt.
   h. Provide galvanized at exterior/wet locations.

6. Maximum Security - Mechanical Operation:
   a. Series/Manufacturer:
      1) 1080A-1/Southern Steel Co.
      2) 5086-K1/Airteq [Airteq has available 5080M series with Mogul cylinder]
      3) 7082/Brink [Brink has available 7080M series with Mogul cylinder]
      4) WLS-1780-K1/Willoughby [WLS has available 1780M series with Mogul Cylinder]

   b. Security Grade: ASTM F 1577 Grade 1.
   c. Door mounted deadbolt.
   d. Lever tumbler, key outside only.
   e. Supply with hollow metal lock mounting, escutcheon, and security screws.
   f. Provide keeper with built-in limit switch where scheduled.
   g. Provide 3/4-inch throw latch bolt
   h. Provide galvanized at exterior/wet locations.

7. Maximum Security - Mechanical Operation:
   a. Series/Manufacturer:
      1) 1070A-2/Southern Steel Co.
      2) 5076-K2/Airteq [DEADLATCH]
      3) 7076/Brink
      4) WLS 1770-K2/Willoughby
   b. Security Grade: ASTM F 1577 Grade 1.
   c. Door mounted, automatic spring deadbolting.
   d. Lever tumbler, key outside and inside.
   e. Supply with hollow metal lock mounting, escutcheons, and security screws.
   f. Provide keeper with built-in limit switch.
   g. Provide 3/4-inch throw latch bolt.
   h. Provide galvanized at exterior/wet locations.
   i. Listed and labeled for use on fire doors.

8. Maximum Security - Mechanical Operation:
   a. Series/Manufacturer:

1) 1070A-1/Southern Steel Co.
2) 5076-K1/Airteq
3) 7072/Brink
4) 1770-K1/Willoughby

b. Security Grade: ASTM F 1577 Grade 1.
c. Door mounted, automatic spring deadbolting.
d. Lever tumbler, key outside.
e. Supply with hollow metal lock mounting, escutcheons, and security screws.
f. Provide keeper with built-in limit switch.
g. Provide 3/4-inch throw latchbolt.
h. Provide galvanized at exterior/wet locations.
i. Listed and labeled for use on fire doors.

9. Medium Security - Mechanical Operation: Food Pass Lock
   a. Series/Manufacturer:
      1) 1017AM/Southern Steel Co.
      2) 5017M/Airteq [Airteq has the smallest latch bolt and the shortest latch bolt throw – need to consider this, as their latch bolt is more easily tampered with; formerly, Airteq had an "extended latch bolt" option but that may no longer be the case]
      3) 7017M/Brink
      4) WLS 1717M/Willoughby
      5) WLS 1717D/Willoughby
   b. Keyed outside only.
   c. Reverse bolt bevel at food pass locations. Refer to details on Drawings.

10. Medium Security - Mechanical Operation: Paper Pass Lock
    a. Series/Manufacturer:
       1) 1017AM/Southern Steel Co.
       2) 5017M/Airteq
       3) 9025/Brink
       4) WLS 1717M/Willoughby
       5) WLS 1717D/Willoughby
    b. Keyed outside only.
    c. Refer to details on Drawings

11. Minimum/Medium Security - Mechanical Operation:
    a. Series/Manufacturer:
       1) 10507 /Southern Steel Co.
       2) 90407/Airteq
       3) _____/Brink
       4) WLS 1100-401/Willoughby
    b. Door mounted, spring latchbolt with auxiliary deadlatch.
    c. Maxi-Mogul pin cylinder lock, key outside only.
    d. Latchbolt operated by key outside and by handle inside.
    e. Deadlatch operated by key outside.
    f. Outside handle is always rigid.
    g. Supply with lever handles and security screws.

h. Provide keeper with built-in limit switch.
i. Listed and labeled for use on fire doors. [NOTE: not available for 10516, 10517, & 10518 deadlock functions]

12. Medium Security - Mechanical Operation: Exterior Chase Door
    a. Series/Manufacturer:
        1) 10516/Southern Steel Co.
        2) 90416/Airteq
        3) 1076/Brink
        4) WLS 1100-DB-K2/Willoughby
    b. Mechanical deadbolt lock for mortise mounting.
    c. Mogul lock cylinder.
    d. 1" deadbolt throw.
    e. Deadbolt operated by key either side.
    f. Provide bolt strike with indication.

13. Maximum Security – Gate Lock – Solenoid Operation
    a. Series/Manufacturer:
        1) 1050D/Southern Steel Co.
        2) 9712P/Airteq
        3) 8050/Brink
        4) WLS 1520G/Willoughby
    b. Security Grade: ASTM F 1577 Grade 1.
    c. Gate post-mounted 115 or 120 VAC, continuous duty solenoid actuated.
    d. Internal bolt is retracted by an energized solenoid by a push-button at the control panel and remains retracted until gate is opened.
    e. Bolt is retracted manually by key from outside and inside or outside only.
    f. Provide galvanized finish.
    g. Provide interlock feature as required.
    h. Internal switches monitor status of bolt.
    i. Mogul lock cylinder.
    j. Provide key cylinder extension where keyed both sides.
    k. 1" deadbolt throw.
    l. Provide bolt strike with indication

E. **Closers**: (Recess Mounted)
    1. Series/Manufacturers:
        a. 2210 Series/LCN
        b. 7970 Series/Norton
    2. Description:
        a. Provide recessed door head closers unless noted otherwise.
        b. All door closers shall be by one manufacturer and carry a fifteen (15) year warranty, except electrical components, which shall carry a two-year warranty. All door closers shall be inspected, after installation, by a factory representative to insure their proper adjustments and operations.
        c. Spring power shall be adjustable. Spring power shall provide an opening force range of 8 to 15 pounds from 0 degrees to 90 degrees.
        d. Closers shall have separate adjustments for latch speed, general speed, and back check.

e. Provide accessories required to insure a proper installation.

F. **Pull Loop**:
1. Series/Manufacturers:
   a. 212-C/Southern Steel Co.
   b. 612/Airteq
   c. 300021/Brink
   d. WDP0108K/Willoughby
2. Stainless steel. Overall length 8-3/4" x 1-1/2" clearance. Fasteners shall be 2-3/8" - 6 x 3/4" stainless steel Torx-head security screws with center reject pin.

G. **Pull Flush**:
1. Series/Manufacturer:
   a. 214-S/Southern Steel Co.
   b. 614/Airteq
   c. 300011/Brink
   d. WFP0405K/Willoughby
2. Stainless steel, 4" wide, 1/8" thick x 5" high. Fasteners shall be 1/4" 20 x 5/16" stainless steel Torx-head security screws with center reject pin.

H. **Push/Pull Plate**:
1. Series/Manufacturer:
   a. 120L/Hager
   b. 1456/Hiawatha
   c. 91-RKW/Rockwood
2. 1/8" thick stainless steel, 3.5" w x 16" h with 7/8" lip projection at bottom. Attach with stainless steel Torx-head security screws with center reject pin.

I. **Door Stops**:
1. Series/Manufacturer:
   a. 650/Airteq (wall or floor)
   b. 606S/Northwest (wall or floor)
   c. 3001/ Stanley (floor); 3002/ Stanley (wall)
   d. 467/Rockwood (wall or floor)
2. Silicone rubber body, 2" diameter. 2-1/2" (3-1/2") high.
3. 5/8" x 2-1/2" diameter mounting shank.
4. Embedded in wall or floor with epoxy resin adhesive.

J. **Thresholds**: (refer to Security Hardware Sets for location)
1. Series/Manufacturer:
   a. 271A - 5" x 1/4"/Pemko
   b. S405A - 5" x 1/4"/Reese
   c. 545 - 5" x 1/4"/Zero
2. Set the aluminum threshold into a full bedding of mastic and secured with stainless steel Torx-head security screws with center reject pin.
3. Threshold shall be ADA compliant.

K. **Thresholds**: (Typical & Anti-Pass)
1. Series/Manufacturer:
   a. 950/NGP
   b. 2010_PK/ Pemko
   c. S257/ Reese

d. 566/ Zero

2. Provide anti-pass thresholds as indicated in the Detention Door Schedule.
3. Provide aluminum mill finish, unless noted otherwise.
4. Set the aluminum threshold into a full bedding of mastic and secured with stainless steel Torx-head security screws with center reject pin.
5. Threshold shall be ADA compliant.
6. Threshold shall prevent the passing of paper or other contraband under the door.

L. Thresholds (Bulkhead System):

1. Series/Manufacturer:
   a. Adjustable Roof Curb Threshold/ Zero (Allegion): (#105/106/107 aluminum vertical wraparounds, 670-series aluminum fluted threshold plates, and #269 aluminum connection plates, as necessary to fit wall thickness, and #570 adjustable stop with neoprene seal).
   b. Approved equal.

M. **Weatherstripping/Sound Seals**:

1. Series/Manufacturer:
   a. 305CR x 315CN/Pemko
   b. DS70C x 362/Reese
   c. 50 x 339 (modified to receive a sweep)/Zero
2. Extruded anodized aluminum with neoprene seal, secured with stainless steel Torx-head security screws with center reject pin.

N. **Weatherstripping/Sound Seals (Bulb type):**

1. Series/Manufacturer:
   a. S88/Pemko
   b. 5050/NGP
   c. 188S/Zero
2. Self-adhesive silicone rubber perimeter seal.

O. **Door Bottom Sweep:**

1. Series/Manufacturer:
   a. 345A (9/16" projection x 1-1/2" H)/Pemko
   b. R199/Reese
   c. 17/NGP
   d. 11/Zero
2. Extruded anodized aluminum, secured with stainless steel Torx-head security screws with center reject pin.

P. **Rain Drip:**

1. Series/Manufacturer:
   a. 346C (2-1/2" projection)/Pemko
   b. R201/Reese
   c. 16/NGP
   d. 142A/Zero

Q. **Automatic Door Bottom**:

1. Series/Manufacturer:
   a. 420ASL/Pemko
   b. 372/Reese
   c. 360/Zero

2. Mortised type, cam-actuated drop down silicone seal, with spring mechanism return.

R. **Kickplates**:
1. Series/Manufacturer:
   a. 194S/Hager
   b. K1050/Rockwood
2. Kickplates shall be 0.050" stainless steel with eased edges. 10" high (except reduce height 1/2" less than bottom rail when required) x 2" less than door width on singles and 1" less on pairs. Fasteners shall be full threaded, oval, undercut, metal screw; Torx-head security screws with center reject pin.

S. **Door Silencers**:
1. Series/Manufacturer:
   a. GJ-64/Glynn-Johnson
   b. 608/Rockwood
   c. SR64/Ives
2. Provide three (3) silencers per door. Silencer design forms an air pocket to absorb shock and reduce noise of door closing. Once installed, the silencers should be tamper-proof and eliminate door rattle.

T. Security Hardware Finishes:

	U.S. Symbol	ANSI Symbol	Description
1. Hinges, Exterior	US32D	630	Satin Stainless Steel
2. Hinges, Interior	US32D	630	Satin Stainless Steel
3. Locks and Pulls	US26D	626	Satin Chromium
4. Closers	AL	689	Aluminum Painted
5. Push, Kick	US32D	630	Satin Stainless Steel
6. Door Pulls	US32D	630	Satin Stainless Steel
7. Escutcheons	US32D	630	Satin Stainless Steel

2.3 CYLINDERS, KEYS, AND KEYING

A. The security locks will incorporate three (3) keying systems, one for pin tumbler (mogul cylinder) locks, one for lever tumbler (paracentric) locks, and one for builder's hardware high security six-pin tumbler cylinder locks. Dye stamp each keying system's keys for identification, corresponding to the final/approved Keying Chart.
1. Review all security keying with Owner for final approval during submittal phase.
2. Provide ASSA mortise and Mogul cylinders for detention locks to match and extend the Owner's existing factory key system used in the main jail.
3. Existing System: Master key or grand master key mogul-cylinder locks to Owner's existing system.
4. Provide a system of keys and matching locks that are color-coded and marked for identification by touch to comply 2021 Virginia Statewide Fire Prevention Code section 403.7.3.6.
5. Key Food Pass locks alike and provide ten (10) keys with dye stamp identification marking.
6. Key Paper Pass locks alike & provide ten (10) keys with dye stamp identification marking.
7. Master key mogul cylinder locks as indicated in Detention Door Schedule and as confirmed with the Owner during the Security Keying Meeting.
8. Provide two (2) keys in each Key Cabinet for all individual key designations.
9. Provide three (3) keys in each Key Cabinet for each Master key designation.

10. Provide a complete, detailed, schematic Keying Chart of the Security Keying System's individual key designations.
    a. Two (2) copies of this Keying Chart, overlaid on an architectural floor plan print, shall be turned over to the Owner/User at the completion of the project. The cost for Keying Chart shall be included with the cost of materials at the time of bidding.

B. Key Control:
1. Provide one (1) Key Cabinet in Central Control __N/A_____. Coordinate exact location with Owner and other equipment to be wall-mounted in the control room.
2. Key Cabinet (wall mounted, surface):
    a. Key Control system shall be furnished with a capacity of 1.75 times the number of individual key designations and shall be a complete dual tag system.
    b. Key Cabinet shall have concealed-type hinge and rounded sides.
    c. Panels must have individual hooks and label pockets formed as an integral part of the panel, for each key type, as required. (i.e. paracentric, P-_; mogul, M-_; builders hardware, B-_).
    d. Key Tags of two (2) types shall be provided, one tag to attach to the individual key designations that permanently stays in the key cabinet and one tag to attach to the individual key designation that is loaned out.
    e. Indexing shall be provided to record information concerning locks and keys alphabetically.
    f. Permanent Loan Registry shall be furnished to protect identity of key borrowers while Receipt Tabs shall be supplied for temporary loan.
3. Keys shall not leave the manufacturer's custody without prior arrangements for delivery and authorization from the Owner.

2.4 SECURITY HARDWARE SETS FOR SECURITY/DETENTION DOORS

A. Provide security hardware equal to items scheduled. Verify electrical devices are appropriate for models indicated. Electrical control connections are included in work of Section 285000 "Security Control System."
1. Smoke seals and automatic door bottoms shall be added to all doors in smoke barriers as required to meet smoke and fire ratings per UL 1784.
2. Food Pass
    a. All doors indicated with food passes in the Options column of the Detention Door Schedule shall have the following additional hardware:
        1 Braun Hinge – 4807-E
        1 Food Pass Lock, Southern Steel 1017AM
        1 Food Pass Lock, Willoughby 1717M

B. Security Hardware Sets Schedule:

HARDWARE SET NO	QUANTITY	CLASS	DESCRIPTION
SH1	3	Hinges	SS 204 FMSS
	1	Lock	SS 10120AE x K2 x KCE
	2	Loop Pulls	SS 212C

	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Door Bottom Sweep/Rain Drip	Pemko 345A
	1	Threshold	Pemko 271A
	1	Door Stop	Airteq #650
	1	Kickplate	
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko 305CR
SH1A	3 or 4	Hinges	SS 204FMSS
	1	Lock	SS 10120AE x K2 x KCE
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Door Bottom Sweep/Rain Drip	Pemko 345A
	1	Threshold	Pemko 271A
	1	Door Stop	Airteq #650
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko 305CR
SH1B	3 or 4	Hinges	SS 204FMSS
	1	Lock	SS 10120AE x K2 x KCE
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Door Bottom Sweep	Pemko 315CN
	1	Threshold	Pemko 271A
	1	Door Stop	Airteq #650
	1	Auto Bottom	Pemko 420ASL

SH1C	3 or 4	Hinges	SS 204FMSS
	1	Lock	SS 10120AE x K2 x KCE
	1	Push/Pull Plate	Hager 120L (hinge side)
	1	Flush Pull	SS 214S
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Anti-Pass Threshold	NGP 950
	1	Door Stop	Airteq #650
	1	Auto Bottom	Pemko 420ASL
SH2	3 or 4	Hinges	SS 204FMSS
	1	Lock	SS 10120AM x K2 x KCE
	2	Loop Pull	SS 212C
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Door Stop	Airteq #650
	1	Kickplate	
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko 305CR
SH2A	3 or 4	Hinges	SS 204FMSS
	1	Lock	SS 10120AM x K2 x KCE
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Door Stop	Airteq # 650
	1	Auto Bottom	Pemko 420ASL

	1	Weatherstrip	Pemko 305CR
SH3	3	Hinges	SS 204FMSS
	1	Lock	SS 10120AM x K1
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Door Position Switch	SS 200MRS TB
	1	Door Stop	Airteq # 650
	3	Silencers	
	1	Steel Closure Plate (as required to provide 3/8" gap at bottom of cell doors – refer to detail on A3.3.1) [coord. drawing no.]	
SH4	3	Hinges	SS 204FMSS
	1	Lock	SS 10120AM x K2 x KCE, Provide no mechanical latch hold back function
	2	Loop Pull	SS 212C
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Door Stop	Airteq #650
	1	Kickplate	
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko 305CR
	1	Jamb-mounted Push Button (for local lock operation)	Airteq # 6300 (mount inside Control Room)
SH5	3	Hinges	SS 204FMSS
	1	Lock	SS 10120AM x K1
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Door Stop	Airteq #650

	1	Kickplate	
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko S88
SH6	1	Corridor Sliding Device	SS 3165LX.bPKM-2 (Emergency Manual Key Release, electric keyswitch Mogul K2)
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Weatherstrip	Pemko 332CR
	1	Door Skirt	
SH6A	1	Corridor Sliding Device	SS 3165LX.bPKM-2 (Emergency Manual Key Release, electric keyswitch Mogul K2)
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Emergency Pushbutton	Airteq #6300 (each side)
	1	Weatherstrip	Pemko 332CR
	1	Weatherstrip (Door Sweep)	Pemko 18061 CNB
		Emergency Pushbutton shall only close door after door is activated by the Emergency Release function specified in Section 285020. Pushbutton shall not otherwise be active	
SH7	3	Hinges	SS 204FMSS
	1	Lock	SS 10300M x K2 x KCE
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Door Stop	Airteq #650
	1	Kickplate	

	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko S88
SH7A	3	Hinges	SS 204FMSS
	1	Lock	SS 10300M x K2 x KCE
	2	Loop Pull	SS 212C
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Door Stop	Airteq #650
	1	Kickplate	
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko S88
	1	Jamb-mounted Push Button (for local lock operation)	Airteq # 6300 (mount inside room)
SH8	3	Hinges	SS 204FMSS
	1	Lock	SS 10300M x K1
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Door Closer	LCN 2210
	1	Door Position Switch	SS 200MRS TB
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko 305CR
	1	Door Stop	Airteq #650
SH9	3	Hinges	SS 204FMSS
	1	Lock (deadbolt)	SS 10516 x Mogul K2
	1	Bolt Strike	500CLDB
	2	Loop Pull	SS 212C
	1	Door Position Switch	SS 200MRS TB
	1	Door Stop	Airteq #650
	1	Auto Bottom	Pemko 420ASL

	1	Weatherstrip	Pemko 305CR
SH10	3	Hinges	SS 204FMSS
	1	Lock	SS 1070A x K1
	1	Keeper	SS 470C
	1	Loop Pull	SS 212C
	1	Flush Pull	SS 214S
	1	Auto Bottom	Pemko 420ASL
	1	Silencers	
	1	Door Stop	Airteq No.650
	1	Escutcheon	SS 218
SH11	3	Hinges	SS 204FMSS
	1	Lock	SS 1080A x K2
	1	Keeper	SS 470CL
	2	Loop Pull	SS 212C
	1	Door Position Switch	SS 200MRS TB
	1	Door Bottom Sweep/Rain Drip	Pemko 345A
	1	Threshold	Pemko 271A
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko 305CR x 315CN
	1	Door Stop	Airteq No.650
	1	Escutcheon	SS 218
	1	Cylinder Shield	SS 219
SH11A	3	Hinges	Airteq #604 FMCS
	1	Deadbolt [Lock]	WLS 1780M x K1
	1	Keeper w/ deadbolt position switch	WLS WL-8002PS
	1	Loop Pull	SS 212C
	1	Door Position Switch	SS 200MRS TB
	1	Door Bottom Sweep/Rain Drip	Pemko 345A

	1	Threshold	Pemko 2001AT [not accessible]
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko 305CR
	1	Door Stop	Airteq No. 650
SH12	1	Lock	SS 1050D Gate Lock x K2
	1	Gate Position Switch	GE 2707A
	1	Self-closing Hinge	Coordinate with gate supplier
SH13	3	Hinges	SS 204FMSS
	1	Lock	SS 10507
	1	Keeper	SS 500CL
	1	Door Closer & Position Switch	LCN 2210 DPS Series
	1	Door Position Switch	SS 200MRS TB
	1	Door Stop	Airteq #650
	1	Weatherstrip	Pemko 305CR
SH14 (Roof Hatch)	1	Lock	SS 1080A x K2
SH15	3	Hinges	SS 204FMSS
	1	Hinge	SS 1080A x K2 SS 204E Power Transfer Hinge [required with 10600 locks]
	1	Lock	SS 10603E [fail secure]
	1	Keeper	SS 500CL
	1	Door Closer & Position Switch	LCN 2210 DPS Series
	1	Door Stop	Airteq #650
	1	Kickplate	
	1	Auto Bottom	Pemko 420ASL
	1	Weatherstrip	Pemko 305CR

C. Security Spare Locks and Lock Parts:

1. Provide the following for the Owner's stock:
   a. 1 Lock 1520M/WLS
   b. 1 Lock 1300M/WLS
   c. 2 Mogul Cylinders
   d. 2 Builders Cylinders
2. One each repair parts kit for each lock series, containing springs, micro switches, screws, nuts and washers.
3. One parts kit containing an assortment (minimum 25) of all hardware security screws used on this project.
4. One complete set of hardware security screwdrivers for all sizes of hardware security screws used on this project.
5. One repair parts list and assembly drawings bound in a manual for all security products supplied in this section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors, frames and hardware for damage, defects, and suitability for intended use. Restore all parts or items found damaged, defective, or inadequate, or replace with good material before installation.

3.2 INSTALLATION

A. Mounting Heights:
   1. Heights given are centerline heights up from finish floor unless noted otherwise; heights given "Number to Number" indicate that all shall be at one consistent height within limits given. Where heights of items are not listed, mount per recommendations of DHI.

a.	Bottom hinge	10 to 13 inches
b.	Top hinge	6 to 8 inches down from head
c.	Intermediate hinges	Equally spaced
d.	Door knobs	36 to 40 5/16 inches
e.	Door pull	42 to 48 inches
f.	Deadlocks	54 inches floor to centerline

B. Fitting:
   1. Fit all hardware accurately and properly.
   2. Remove exposed parts until after painting is completed. Then reinstall.
   3. Securely fasten all fixed parts.
   4. Fit faces of mortised parts snug and flush.
   5. Ensure operating parts move freely and smoothly without binding, sticking, or excessive clearances.

C. Adjusting and Finishing:
   1. After work has been otherwise completed, examine all hardware for complete and proper installation.
   2. Lubricate bearing surfaces of moving parts
   3. Adjust latching and holding devices to proper function
   4. Adjust door closer devices for proper speed and power.
   5. Test keys for conformance to approved Keying Chart system.
   6. Clean all exposed surfaces, check for surface damage and then polish.

D. Thresholds:
   1. Install in one continuous piece, full width of opening. Set in full bed of sealant and fasten with countersunk anchors at 6 inches on center with Torx-head security screws with center reject pin.

3.3 DEFECTIVE WORK

A. Where hardware is found defective in materials or installation; rework, restore, replace, or otherwise correct as directed.

B. The following will be considered as defective materials:
   1. Unauthorized substitutions.
   2. Items delivered with missing, broken, damaged or defaced parts.
   3. Items of incorrect hand or function.

C. The following will be considered as defective installation:
   1. Items broken, damaged, or defaced after delivery.
   2. Items incomplete, misaligned or incorrectly located.

D. All expenses incurred by the Architect in troubleshooting the Security Hardware Work, caused by inadequate workmanship or other form of non-performance on the part of the subcontractor, shall be borne by that subcontractor.

END OF SECTION 111960

SECTION 113013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities.

C. UL (DIR) - Online Certifications Directory.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with a service center within 50 miles of Project site capable of maintenance and emergency repairs.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

C. Accessibility: Where ADA-compliant appliances are indicated, provide appliances that comply with reach ranges and operable parts requirements in compliance with ICC A117.1 and ADA Standards.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. BOSCH Home Appliances.
   2. Fisher and Paykel.
   3. Frigidaire Home Products.
   4. GE Appliances.
   5. Jenn-Air.
   6. Maytag.
   7. Whirlpool Corp.

2.02 KITCHEN APPLIANCES

A. Refrigerator: Free-standing, French door with bottom freezer, and frost-free.
   1. Basis-of-Design Product: GE Appliances; Model GWE22JYMFS.
   2. Capacity: Total minimum storage of 21 cubic ft; minimum 25 percent freezer capacity.
      a. Provide ADA-compliant model; at least 50 percent of freezer shall be located within 54 inches of floor.
   3. Energy Usage: Provide ENERGY STAR qualified product.
   4. Features: Include glass shelves, automatic icemaker, and light in freezer compartment. Do not provide water dispenser.
   5. Electrical Requirements: 120V; 60 Hz; 15 Amp.
   6. Exterior Finish: Stainless steel.

B. Range: Electric, free-standing, with glass-ceramic cooktop and integral backsplash.
   1. Basis-of-Design Product: GE Appliances; Model JB480SYSS.
   2. Size: 30 inches wide.
   3. Oven: Self-cleaning with electronic ignition.
      a. Oven Capacity: 5.0 cubic ft.
   4. Elements: Four (4); two 2000W 8-inch and two 1500W 6-inch.
   5. Controls: Push-to-turn knobs with electronic clock and timer.
      a. Provide ADA compliant model with controls located at the front of the unit.
   6. Features: Include automatic meat thermometer, storage drawer, oven door window, broiler pan and grid, and oven light.
   7. Electrical Requirements: 208/240V; 60 Hz; 40 Amp.
   8. Exterior Finish: Stainless steel and black.

C. Cooking Exhaust: Range hood.
   1. Basis-of-Design Product: GE Appliances; Model JVX5305SJSS.
   2. Size: 30 inches wide.
   3. Fan: Two-speed, 270 cfm.
   4. Energy Usage: Provide ENERGY STAR qualified product.
   5. Exhaust: Recirculating.
   6. Features: Include cooktop light, backdraft damper, and removable, washable filter.
   7. ADA Controls: Provide wall mounted controls adjacent to range to comply with accessibility requirements. Coordinate with Division 26 electrical contractor to provide wiring to the control location and for cover plate with finish matching other cover plates in the space.
   8. Electrical Requirements: 120V; 60 Hz; 1 Amp.
   9. Exterior Finish: Stainless steel, color to match range.

D. Dishwasher: Undercounter. Provide ADA compliant product, no more than 32-1/4 inch high, to fit under 34 inch counter.
   1. Basis-of-Design Product: GE Appliances; Model GDT226SSLSS.
   2. Width: 24 inches.
   3. Controls: Solid state electronic, top mounted in door.
   4. Energy Usage: Provide ENERGY STAR qualified product.
   5. Wash Levels: Three (3); auto, heavy, and light.
   6. Features: Include rinse aid dispenser, temporary temperature boost option, child lock, delay start, and sanitize option.
   7. Electrical Requirements: 120V; 60 Hz; 8.9 Amp.
   8. Finish: Stainless steel.

2.03 ICE MAKER

A. Ice Maker: Free-standing, undercounter, air-cooled ice maker with cube-type ice machine and built-in storage bin, with adjustable leveling feet.
   1. Manufacturers:
      a. Avantco.
      b. Hoshizaki.
      c. Manitowoc.
      d. Scotsman.
   2. Overall Unit Dimensions: 18 inches wide by 22.5 inches deep by 31.5 inches high.

3. Ice Making Capacity: 50 pounds in 24 hours.
4. Storage Capacity: 25 pounds.
5. Electrical Requirements: 115 V; 60 Hz.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION 113013

SECTION 115314
FUME EXTRACTORS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

D. ASTM D5857 - Standard Specification for Polypropylene Injection and Extrusion Materials Using ISO Protocol and Methodology.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of fume extractors with casework and indicated fixture and equipment locations.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.03 SUBMITTALS

A. Product Data: Fume extractor(s) dimensions and construction, utility and service requirements and locations, reach range diagrams.

B. Shop Drawings: Indicate locations, large scale plans, elevations, cross sections, rough-in dimensions and tolerances, clearances required, locations and types of mounting accessories.

C. Operation Data: Include description of fume extractor(s) operation and required adjusting and testing.

D. Maintenance Data: Identify system maintenance requirements, servicing cycles, lubrication types required and local spare part sources.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.05 FIELD CONDITIONS

A. Ambient Conditions: Maintain temperature and relative humidity at occupancy levels during and after installation of fume extractors.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide two-year manufacturer warranty for manufacturer's standard items (listed by part number in manufacturer's official publication).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design: Movex; Model MET 2000-75 STD.

B. Alsident System A/S.

C. Nederman.

D. Plymovent.

2.02 MANUFACTURED UNITS

A. Fume Extraction Arms - General: Local exhaust ventilation device connected to facility air exhaust system.

1. Provide extraction systems consisting of:
    a. Multiple articulated rigid arms connected with rotating joints.
    b. Fume collection hood.
    c. Mounting connectors and brackets.
2. System capable of 360 degrees rotation at joints, with a damper at one of the joints, and thumbscrews for fixing the angle of each arm.
3. Fume Extraction Arm:
    a. Application: Common fumes, no requirements for anti-static or increased chemical resistance.
    b. System Diameter: 3-7/8 inches at mounting bracket connector; 3 inches nominal at inflow nozzle.
    c. Exhaust Capacity (Optimal Airflow Range): 70-85 CFM.
    d. Maximum Noise: Noise at maximum airflow: 62 dB(A).
    e. Maximum Fume Temperature: 158 degrees F.
    f. Main System: Three-arms.
        1) Ceiling Connector: Manufacturer's standard, for ceiling, wall or bench mounting.
        2) Connector Joints: White polypropylene.
        3) Upper and Lower Arms and Collection Hood Arm: Anodized aluminum tube.
        4) Joint with Damper: White polypropylene.
        5) Damper Handle: Manufacturer's standard.
        6) Collection Hood: Flat, transparent PETG; nominal 8 inches by 12 inches. Basis-of-Design Movex MEPH 300-75. Nominal 3 inch diameter to connect to articulating arm inflow nozzle.
        7) Thumbscrews: Manufacturer's standard head, diameter coordinated with hole in elbow.
    g. Accessory components:
        1) Ceiling Mounting Bracket: Manufacturer's standard mounting bracket for attaching fume extraction assembly to structure.
        2) Ceiling Cover Plate: Manufacturer's standard cover plate for use at ceiling penetration opening for Extension Column/Arm.
        3) Support Collar/Bracket: Manufacturer's standard Collar/Bracket for bracing Upper Arm of system.
        4) Airflow Alarm: Manufacturer's standard audible and visual alarm, with adjustable airflow velocity alarm setpoint.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 ASTM B221M.
   1. Finish: Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 clear anodic coating not less than 0.7 mils thick.

B. Polypropylene: ASTM D5857.
   1. Polyethylene Terephthalate Glycol (PETG): Transparent, thermo-formed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Locate framing that supports fume extractors above ceiling by field measurements before being concealed or enclosed, and indicate measurements on shop drawings.

B. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume extractors.

C. Coordinate locations with casework. Confirm installed fume extractor will allow opening doors, and access to contents, of adjacent wall (upper) cabinets.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and shop drawings.
   1. Do not mount to metal roof deck. Securely install to primary structural beams/joists or slotted metal track/bracing between primary structural elements.

B. Interface With Other Work: Interface with installation of above-ceiling supports and/or bracing, ceilings, laboratory casework, and other types of laboratory ventilation equipment and systems.

C. Systems Integration: Integrate fume extractors into overall exhaust system installation, including controls.

3.03 ADJUSTING

A. Adjust moving parts for smooth, near silent, operation with one hand.

3.04 CLEANING

A. Clean finished surfaces, touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

3.05 CLOSEOUT ACTIVITIES

A. Final Acceptance:
   1. Remove labels, fingerprints, and clean all surfaces both inside and out.
   2. Repair any marred or damaged surfaces that affect appearance, such as both interior and exterior of extractors in a manner acceptable to Owner.
   3. Replace any parts that cannot be repaired in such a manner.

B. Demonstration: Demonstrate operation of fume extractors to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

3.06 PROTECTION

A. Protect installed local fume extractors from subsequent construction operations.

END OF SECTION 115314

SECTION 116724
BULLET TRAPS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Submit manufacturer's complete product data for each type of bullet trap specified.

B. Shop Drawings: Indicate project-specific installation locations and required clearances around all sides, for each bullet trap indicated.

C. Certificate: Certify that each specified bullet trap meets or exceeds foot pounds of energy (FPE) requirement indicated.

D. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions, including list of replacement parts and sources of supply.

E. Executed warranty.

1.02 WARRANTY

A. Manufacturer Warranty: Provide manufacturer standard warranties for terms indicated below, covering failures in materials or workmanship; commencing on Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

1. Clearing Bullet Trap, Freestanding: 2 year limited warranty.
2. Clearing Bullet Trap, Tabletop: 2 year limited warranty.

PART 2 PRODUCTS

2.01 CLEARING BULLET TRAPS

A. Clearing Bullet Trap, Freestanding Model: Provide one-piece, fully welded prefabricated clearing bullet trap for free-standing applications, factory finished of AR500 steel with standard powder coat finish. The trap shall incorporate low-angle impact plates, deceleration area with ballistic rubber interior, and collection chamber. The unit shall be designed for use with handguns, shotguns and rifles up to 3000 FPE. It shall not be designed to accept armor-piercing ammunition.

1. Manufacturers:
   a. Savage Range Systems, Inc; "Guardian" Model TP5014 (Basis-of-Design).
   b. Action Target.
   c. Paragon Tactical, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect all areas, surfaces, and in-place work before beginning installation. Notify Architect of unsatisfactory or detrimental conditions.

B. Take field measurements to ensure proper fitting of work; verify field dimensions and clearances are acceptable for anticipated required dimensions for the Work.

C. Do not proceed with this work until unsatisfactory conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

3.02 COORDINATION

A. Coordinate with embedded anchors and work by other trades to ensure all required elements are installed properly and in accordance with the installation requirements for products of this section.

3.03 INSTALLATION

A. Install each equipment type in accordance with manufacturer's written instructions.

3.04 CLEANING & PROTECTION

A. Protect installed products and equipment from subsequent construction operations.

B. Clean installed products thoroughly prior to Date of Substantial Completion.

END OF SECTION 116724

SECTION 122400
WINDOW SHADES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 70 - National Electrical Code.

C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

D. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

E. WCMA A100.1 - Standard for Safety of Window Covering Products.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

B. Sequencing:

1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
2. Do not install shades until final surface finishes and painting are complete.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

B. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

C. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Authorized installation representative of fabricator/manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following minimum terms:
   1. Electric Motors and Components: 5 years, minimum.
   2. Manual Operating Mechanism / Clutch: 10 years, minimum (excludes bead chain).
   3. Fabric: 10 years, minimum.
   4. Balance of Shade Hardware and Non-Operating Materials and Components: 25 years, minimum.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Draper, Inc; Clutch Operated FlexShade.
   2. Hunter Douglas Architectural; RB500 Manual Roller Shades.
   3. Lutron Electronics Co., Inc; Contract Roller Manual Roller Shades.
   4. MechoShade Systems LLC; Mecho/5 System.
   5. WT Shade, an InPro Company; HeliaRise.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Interior Motorized Roller Shades, Motors and Motor Controls:
   1. Draper, Inc; Motorized FlexShade.
   2. Hunter Douglas Architectural; RB500 Motorized Roller Shades.
   3. Lutron Electronics Co., Inc; Contract Roller Motorized Roller Shades.
   4. MechoShade Systems LLC; Electroshade.
   5. WT Shade, an InPro Company; MotoRise.
   6. Substitutions: See Section 016000 - Product Requirements.

C. Source Limitations: Provide products produced by a single manufacturer and obtained from a single supplier.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.
   3. Motorized Shades: Motor system housed inside roller tube, controlling shade movement via motor controls indicated; listed or recognized to UL 325.
      a. Comply with NFPA 70.
      b. Electrical Components: Listed, classified, and labeled as suitable for the purpose intended. Where applicable, system components to be FCC compliant.
      c. Motors: Size and configuration as recommended by manufacturer for the type, size, and arrangement of shades to be operated; integrated into shade operating components and concealed from view; fully compatible with controls to be installed.

B. Roller Shades **[MISC-5]**:
   1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
      a. Drop Position: Regular roll.
      b. Roll Direction: Roll down, closed position is at window sill.
      c. Mounting: Jamb mounted within rough opening, unless otherwise indicated.
         1) Where length exceeds maximum of a single shade section and jamb mounting is not feasible, provide for mounting to overhead/lintel construction.
         2) Secure to the structural building construction at jambs or overhead as indicated (masonry, cold-formed steel framing). Shades shall not be mounted directly to window frames or mullions.
      d. Size: As indicated on drawings for rough opening sizes; field verify rough openings prior to fabrication.
   2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   3. Roller Tubes: As required for type of shade operation.
      a. Material: Extruded aluminum, clear anodized finish or electrogalvanized/epoxy primed steel, as standard with manufacturer.
      b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      c. Fabric Attachment: Utilize manufacturer's standard method for attaching shade fabric material to rollers.
   4. Hembars: Designed to maintain bottom of shade straight and flat.
      a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
   5. Manual Operation for Interior Shades:
      a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
      b. Drive Chain: Continuous loop beaded ball chain, 95 pounds minimum breaking strength. Provide upper and lower limit stops.
      c. Safety Device: At all chain/loop operators, provide a WCMA A100.1 compliant chain tensioning hold-down device/retainer.
   6. Accessories:
      a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; clear anodized finish.
      b. End Caps: Provide manufacturer's standard end caps to cover exposed ends of brackets.
      c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 SHADE FABRIC

A. Fabric: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Products (1%): Vinyl coated fiberglass.
      a. Mermet Corporation; E-Screen - 1%.
      b. Lutron Electronics Co., Inc; Basketweave 27 - 1%.
      c. Phifer, Inc; SheerWeave 2410 - 1%.
   2. Performance Requirements:
      a. Flammability: Pass NFPA 701 large and small tests.

b. Fungal Resistance: No growth when tested according to ASTM G21.

3. Color: To be selected by Architect from manufacturer's full range.
4. Fabrication:
   a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.
   b. If height of opening requires multiple panels of railroaded fabric, use manufacturer's standard sewn seams.

2.04 MOTOR CONTROLS

A. Provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.

B. Provide all components and connections necessary to interface with other systems as indicated.

2.05 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/4 inch maximum space between bottom bar and window stool.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb, with maximum 1/4 inch gap at each edge of jamb.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

C. Jamb mount shades at each end within the rough opening unless otherwise indicated. At large openings where multiple shades are required and jamb mount is not feasible, overhead mount shade to overhead/lintel construction. Do not mount to window framing.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 122400

SECTION 123553.19
WOOD LABORATORY CASEWORK

PART 1 GENERAL

1.01 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.02 REFERENCE STANDARDS

A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods.

C. ASTM C1036 - Standard Specification for Flat Glass.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

F. BHMA A156.9 - Cabinet Hardware.

G. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

H. ICC (IFC) - International Fire Code.

I. NFPA 1 - Fire Code.

J. NFPA 30 - Flammable and Combustible Liquids Code.

K. SEFA 1 - Laboratory Fume Hoods.

L. SEFA 2 - Installations.

M. SEFA 8W - Laboratory Grade Wood Casework.

N. UL 1805 - Standard for Safety Laboratory Fume Hoods and Cabinets.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of casework with related items.
   1. Service Fixtures: Coordinate location and characteristics of service connections.
   2. Equipment and Instruments: Coordinate installation of casework with equipment and scientific instruments.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Keying Conference: Conduct conference prior to ordering keys. Incorporate conference decisions into keying submittal.

1.04 SUBMITTALS

A. Product Data: Component dimensions, configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.

B. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements placement dimensions and tolerances, clearances required, and utility locations, if any.

C. Test Reports: From independent laboratory indicating compliance with referenced chemical-resistance standards for cabinet finish and liner materials.

D. Maintenance Data: Manufacturer's recommendations for care and cleaning.

E. Finish touch-up kit for each type and color of materials provided.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with SEFA 8W certification for wood casework.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:

1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:

1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" paragraph of this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Laboratory Casework:

1. Diversified Woodcrafts.
2. Institutional Casework Inc (ICI Scientific).
3. Kewaunee Scientific Corp.
4. Leonard Peterson & Co., Inc.
5. Mott Manufacturing.
6. Stevens Industries.
7. Substitutions: See Section 016000 - Product Requirements.

B. Countertops:

1. Durcon (Epoxy resin, Solid phenolic).
2. Panolam Industries International, Inc.
3. Trespa (Solid phenolic).
4. WilsonArt (Solid phenolic).

5. Substitutions: See Section 016000 - Product Requirements.

2.02 WOOD LABORATORY CASEWORK

A. Wood Laboratory Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
   2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
      a. Base Cabinets: 22 inches.
      b. Tall Cabinets: 22 inches.
      c. Upper Cabinets: 16 inches.
   3. Construction: Joints doweled, glued and screwed, except drawers may be lock-shoulder jointed; with interior of units smooth and flush; cabinet bottom flush with top of face frame; without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
   4. Fittings and Fixture Locations: Cut and drill counter tops, backs, and other components for service outlets and fixtures.
   5. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.
   6. Fixed panels at backs of open spaces between base cabinets and at ends of utility spaces not otherwise enclosed.
   7. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
   8. Base: Coordinate with Division 9 Section "Resilient Base & Accessories", provide continuous resilient base around all fixed cabinet bases.
   9. Factory-finish all exposed and semi-exposed surfaces with the same finish.
      a. Finish Performance: Provide finish on all surfaces having chemical resistance of Level 0 (no change) or Level 1 (slight change of gloss or slight discoloration) according to SEFA 8W and no visible effect when surface is exposed to:
         1) Hot water at temperature between 190 degrees F and 205 degrees F trickled down the test surface at 45 degree angle for 5 minutes.
         2) Constant moisture in the form of 2 by 3 by 1 inch thick cellulose sponge kept continually saturated with water and in contact with test surface for 100 hours.
      b. Preparation: Wood sanded smooth, free from dust and mill marks.
      c. Coating: Clear, superior-quality, chemical-resistant acyclic urethane; applied in accordance with manufacturer instructions, force-dried, sanded and wiped clean.
      d. Coats: Multiple coats as required to achieve minimum 1.5 mil dry film thickness.
      e. Appearance: Clear satin gloss; not cloudy or muddy.

B. Solvent (Flammable and Combustible Liquids) Storage Cabinets: Pre-fabricated steel cabinets, complying with the following:
   1. Construct to NFPA 30 and applicable OSHA requirements.
   2. Fire Resistance: Maximum internal temperature of 325 degrees F at the center, and 1 inch from top of the cabinet when cabinet is subjected to a ten minute fire test that simulates fire exposure of a standard time-temperature curve specified in ASTM E119.
   3. Shelves: Full depth, adjustable.
   4. Bottom Pan: 2 inches deep, corrosion-resistant, liquid-tight pan covering entire bottom of cabinet.

5. Cabinet Hardware: UL-listed.
    a. Hinges: Full-length stainless steel continuous (piano) hinges.
    b. Self-closing Doors: Comply with requirements of NFPA 1 and ICC (IFC). Minimum 90 degree opening. Three-point latch arrangement, door(s) shutting and latching automatically when hold-open device's fusible link melts at 165 degrees F under fire conditions outside the cabinet. At pair of doors, synchronize latching so that both doors always fully close.
    c. Door Handles: Manufacturer's standard, with slip-resistant grip.
        1) Provide manufacturer's standard cylinder lock and key set.
6. Signage: Provide manufacturer's standard signage reading "FLAMMABLE - KEEP FIRE AWAY" or similar message in bright red color.

C. Tables: With standard aprons manufactured of not less than 3/4 by 3 1/2 inch solid hardwood lumber, machined to receive corner blocks, and bolted to 2 1/8 by 2 1/8 inch solid hardwood legs. 3/8 inch leveling devices, and slip-on type black PVC or rubber shoes.
1. Provide 30 inch standard table height unless otherwise indicated.

2.03 CABINET HARDWARE

A. Comply with BHMA A156.9 requirements.

B. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.
1. Hinged Doors: Cam type lock, bright chromium plated over nickel on base material.
2. Tall Hinged Doors: Three-point latching system.
3. Keying: Key locks alike within a space; key each room separately.
4. Master Key System: All locks operable by master key.

C. Shelves in Cabinets:
1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.

D. Swinging Doors:
1. Hinges: Offset pin, number as required by referenced standards for width, height, and weight of door.
    a. European-Style Hinges: For overlay doors, concealed. Steel, nickel-plated, 110 degree opening angle.
2. Catches: Magnetic.
3. Pulls: Chrome wire pulls, 4 inches wide.

E. Drawers:
1. Pulls: Chrome wire pulls, 4 inches wide.
2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.04 COUNTERTOPS

A. Countertops:
1. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
    a. Flat Surface Thickness: 1 inch, nominal.
    b. Surface Finish: Smooth, non-glare.
    c. Color: Black.

d. Exposed Edges and Corners: Beveled or radiused approximately 3/16 inch.

e. Drip Edge: Drip groove 1/8 inch wide and deep, located 1/2 inch back from edge on underside of each exposed edge.

f. Back and End Splashes: Same material, same thickness; separate for field attachment.

2.05 MISCELLANEOUS LAB CASEWORK AND ACCESSORIES

A. Demonstration Station: Prefabricated unit with locking base cabinets and drawers, constructed of veneered plywood of species and finish matching built in wood casework; with 1 inch thick epoxy top. Provide in configuration and dimensions as indicated on Drawings, and with the following features:

1. Mobile Unit: Provide with heavy duty, locking, 4-inch ball-bearing casters.
2. Sink: Stainless steel sink with galley-type pump. Provide with molded plastic containers in base cabinet for both fresh water and waste water.
3. Apparatus Rod/Greenlaw Arm Assembly: Adjustable aluminum assembly with either one or two vertical rods and corresponding sockets in epoxy top, per manufacturer's standard assembly, and with horizontal crossrod and clamping hardware.
4. Power: 120V duplex outlet, with a minimum 9 foot long extension cord.

B. Pegboards: Epoxy pegboards with pre-drilled or punched holes in a staggered pattern, designed to accept removable white polypropylene pegs. With each pegboard include a stainless steel drip-trough with drain outlet and matching diameter 36 inches long PVC drain hose.

1. Size: 30 inches wide by 30 inches high.

C. Goggle Cabinet: Wall-mounted steel reinforced cabinet designed to store and sanitize protective goggles. Unit shall have automatic timer control that operates a germicidal lamp to sanitize goggles. Unit shall be fully factory assembled and pre-wired and doors shall be equipped with locks. Unit shall measure 24-1/2 inches wide by 32 inches high by 9-1/2 inches deep and have manufacturer's standard baked enamel finish.

D. Fire Blanket and Cabinet: Pre-fabricated steel cabinet with baked enamel finish and the lettering "FIRE BLANKET". Cabinet shall contain a minimum 62-inch by 80-inch woven blanket treated with fire-resistant chemicals to conform to Federal Specification #CS-191-53. Cabinet shall be drop type with hinged bottom panel and manual release. Mount cabinet such that release mechanism is less than 48 inches above floor.

2.06 FUME HOODS

A. General Requirements: Provide manufacturer's standard complete fume hood assembly, fabricated of steel internal structure and sheet steel cladding with manufacturer's standard chemical-resistant finish.

1. Comply with SEFA 1; and provide fume hoods UL listed and labeled for compliance with UL 1805; include labeling on the face of fume hood.
2. Configuration: Bench top type, with 36 inch height to work surface. Provide integral lockable base cabinets constructed of corrosion-resistant steel for storage of flammables and acids. Provide "ceiling skirt" finished to match steel sheet cladding to close fume hood to ceiling, with hinged access panel.
3. Interior Construction: Provide epoxy resin internal countertop work surface and manufacturer's standard lining of epoxy-coated steel sheet or glass-fiber-reinforced epoxy.
4. Sash: Provide vertical operating sash fabricated of steel sheet and 1/4 inch tempered safety glass, with counter-balance system designed to allow operation at a maximum 7 pounds of force over complete travel height; counter-balance shall be capable of holding

sash open at any position without creep. Provide rubber bumpers at limit of travel horizontally and vertically.

5. Fittings: Provide gooseneck faucet, epoxy resin cup sink, and gas turret with ball valve within the fume hood. Provide a recessed duplex outlet on hood face.
6. Pre-wire fume hoods for service fittings, light fixtures and receptacles. Coordinate with Division 22, 23, and 26 contractors to ensure utility services are properly sized and located.
    a. Terminate all wiring in a junction box on top of hood.

B. Restricted-Bypass Fume Hoods:
1. Standard Performance: Fume hood shall be tested per ASHRAE Std 110 and shall provide an average face velocity of 100 fpm with sash fully open, with no more than 10 percent variation.
2. Bypass: Provide a compensating bypass arrangement above the sash to open after sash is closed to less than 20 percent open. Bypass to maintain exhaust capacity of at least 25 CFM per square foot of work surface regardless of sash position.
3. Provide an electronic control unit designed to use input from a sensor that monitors face velocity or sash position to modulate a dedicated exhaust damper in order to maintain a near-constant fume hood face velocity.
    a. Provide with safety monitor/alarm system that monitors face velocity and provides audible and visual alarm if face velocity drops below safe levels.
    b. Provide control unit with a manual-override switch that allows the operator to fully open the exhaust damper.
    c. Provide control unit with outputs for interfacing with building's HVAC control system.

2.07 MATERIALS

A. Wood-Based Materials:
1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

B. Exposed Solid Wood: Clear, dry, sound, selected for compatible grain and color, no defects.
1. Wood Species: White maple; plain sliced.

C. Exposed Hardwood Plywood: Veneer core; HPVA HP-1 Grade A, same species as exposed solid wood, clear, compatible grain and color, no defects; minimum 1/50 inch thick. Band exposed edges with Grade J solid wood of same species as veneer.

D. Semi-Exposed Hardwood Plywood: Veneer core; HPVA HP-1 Grade B or C, any species similar in color and grain to exposed portions. Band exposed edges with Grade J solid wood of same species as veneer.

E. Concealed Solid Wood or Plywood: Any species and without defects affecting strength or utility.

F. Solid Epoxy Resin: Modified epoxy resin and non-asbestos inert fillers cast into sheets.

G. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered and complying with ANSI Z97.1; 3/16 inch thick minimum; clear.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Environmental Conditions:

1. Do not deliver casework until the following conditions have been met:
   a. Building has been enclosed (windows and doors sealed and weather-tight).
   b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
   c. Ceiling, overhead ductwork, piping, and lighting have been installed.
   d. Installation areas do not require further “wet work” construction.

B. Verify adequacy of support framing and anchors.

C. Verify that service connections are correctly located and of proper characteristics.

3.02 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.
   1. Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 3/4 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
   2. Wall Cabinets: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
      a. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inch per story.
      b. Maximum Variation of finished gypsum board surface from true flatness exceeds 1/8 inch in 10 feet in any direction.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
   2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
   3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
   4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
   5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.

G. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

H. Vented Cabinets: Install in strict compliance with manufacturer's written installation instructions.
   1. Install vent kits and connect to fume hood exhaust system.
   2. Use only rigid materials for venting. No flexible materials permitted.

I. Countertops: Install countertops in one true plane, with ends abutting at hairline joints, and no raised edges.

J. Replace units that are damaged, including those that have damaged finishes.

3.03 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.04 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.05 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.

C. Repair damage that occurs prior to Date of Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 123553.19

SECTION 210500 - COMMON WORK RESULTS FOR FIRE-SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 QUALITY ASSURANCE

A. Equipment and appliances comprising portions of the mechanical systems regulated by the International Mechanical Code shall be listed and labeled in accordance with the current edition of the Virginia Building Code.

B. Equipment and appliances comprising portions of the fire suppression systems regulated by the NFPA 13 shall be installed in accordance with the listing and the manufacturer's installation instructions. Manufacturer's installation instructions shall be available on the job site for use and inspection.

C. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

D. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Fire-suppression piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

E. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.4 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.

1.5 INTENT OF CONTRACT DOCUMENTS

A. Fire Suppression/Protection drawings are diagrammatic, indicating general locations and arrangements of pipe, and equipment. Not necessarily indicating all offsets, conditions, and appurtenances required to provide clearances for maximum practical accessibility to perform maintenance.

B. Coordinate work to achieve proper operation and to provide a maintainable installed condition.

C. Notify the Architect's representative immediately of conditions which do not comply or will not produce this result.

PART 2 - PRODUCTS

2.1 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match fire-suppression piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180ºF.

D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225ºF.

F. Dielectric Nipples: Electroplated steel nipple with inert and non-corrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225ºF.]

2.2 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Metraflex Co.
    d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 JOINING MATERIALS

A. Pipe Joint Compound for Threaded Pipe: UL listed.

2.4 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.5 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around fire-suppression piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw. Finish: Polished chrome-plated and rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw. Finish: Polished chrome-plated and rough brass.

E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With exposed-rivet hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 FIRE-SUPPRESSION PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install fire-suppression piping according to the following requirements and Division 21 Sections specifying fire-suppression piping systems.

B. Install fire-suppression piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install fire-suppression piping indicated to be exposed and fire-suppression piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise. Diagonal runs are permitted in the attic spaces.

D. Install fire-suppression piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install fire-suppression piping to permit valve servicing.

F. Install fire-suppression piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. Fire-suppression piping:

a. Fire-suppression piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Fire-suppression piping: One-piece, cast-brass type with polished chrome-plated finish.

c. Insulated Fire-suppression piping: One-piece, stamped-steel type with spring clips.
d. Bare Fire-suppression piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Fire-suppression piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
f. Bare Fire-suppression piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
g. Bare Fire-suppression piping in Equipment Rooms: One-piece, cast-brass type.
h. Bare Fire-suppression piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

J. Sleeves are not required for core-drilled holes through solid concrete walls and floors.

K. Sleeves are required in all interior partitions.

L. Permanent sleeves are not required for holes formed by removable PE sleeves.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

3. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 FIRE-SUPPRESSION PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying fire-suppression piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or pipe joint compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Grooved Joints: Assemble joints with listed coupling, gasket, lubricant, and bolts.

1. Ductile-Iron Pipe: Radius-cut-groove ends of piping. Use grooved-end fittings and grooved-end-pipe couplings.

2. Steel Pipe: Roll-groove piping. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.

F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Plastic Fire-suppression piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Fire-suppression piping: Join according to ASTM D 2846/D 2846M Appendix.

I. Plastic Pressure Fire-suppression piping Gasketed Joints: Join according to ASTM D 3139.

3.3 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

B. Field Welding: Comply with AWS D1.1.

3.5 GROUTING

A. Mix and install grout for fire suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.6 EXCAVATION AND BACKFILL

A. Excavation and backfill shall be as indicated in Division 1 specifications and on the drawings. If excavation and backfill is not otherwise indicated the following shall apply:
   1. Excavate trenches to indicated gradients, lines, depths, and elevations.
      a. Beyond the building perimeter, excavate trenches to allow installation of top of pipe below minimum depth of cover based on locality or 1'-0" below frost line whichever is lower.
   2. Excavate trenches to uniform widths to provide twelve inches clear on each side of pipe. Excavate trench walls vertically from trench bottom.
   3. Trench Bottoms: Excavate trench bottoms to provide flat surface. Place and compact six inches of sand. Excavate and shape sand to provide uniform bearing and support of pipes. Shape sand to provide continuous support for bells, joints, fittings, and barrels of pipes. Sand shall be free of projecting stones and sharp objects.
   4. Backfill and hand tamp to 95% proctor to six inches above the top of the pipe.
   5. Backfill and machine tamp the remainder of the trench to 95% proctor in twelve-inch lifts.

END OF SECTION 210500

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SECTION 210548 - VIBRATION AND SEISMIC CONTROL FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning & Development for the State of California.

D. ASCE: American Society of Civil Engineers

E. VUSBC: Virginia Uniform Statewide Building Code

1.3 PERFORMANCE REQUIREMENTS

A. Seismic design category: C

1. Provide Seismic installation on all fire suppression systems as required by ASCE Standard 7-22.
2. Building Classification Category (Risk Category, IBC Table 1604.5): IV
3. Seismic Importance Factor (Ie): 1.5

B. Wind-Restraint Loading:

1. Nominal Design Wind Speed (3 second gust): 97 MPH
2. Ultimate Design Wind Speed (3 second gust): 125 MPH
3. Building Classification Category (Risk Category): IV.
4. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is perpendicular to the wind direction, and 45 degrees either side of perpendicular.

C. Component coefficients shall be in accordance with the ASCE 7-22.

1.4 RESPONSIBILITIES:

A. The manufacturer of vibration isolation and seismic restraint systems and devices shall:

1. Determine the sizes and locations of isolators and seismic restraints.
2. Provide equipment isolation and seismic restraint indicated.
3. Guarantee indicated isolation system deflections.
4. Provide installation instructions and drawings.

5. Certify correctness of installation upon completion.

B. The Contractor shall cause all vibration isolation systems, including the isolators, seismic restraints/snubbers and flexible connectors between the isolated equipment and associated piping, ducting, and electrical work to be designed by a manufacturer experienced in this type of work.

1.5 SUBMITTALS

A. Product Data:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
4. Seismic and Wind-Restraint Details:
   a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
   c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors.

B. Coordination Drawings: For areas indicated at ¼" = 1'0" and where sections are cut on contract drawings, indicate coordination of seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, include other supports and seismic restraints.

C. Qualification Data: For testing agency.

D. Shop Drawings:

1. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
2. Dimensioned Outline Drawings for Each Scheduled Piece of Equipment: Identify center of gravity.
3. Dimensioned Outline Drawings for Each Scheduled Piece of Equipment: Locate and describe mounting and anchorage provisions.

E. Manufacturer Seismic Qualification Certification: Submit certification that all specified equipment will withstand seismic forces identified in "Performance Requirements" Article above. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

D. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers:

1. Amber/Booth Company, Inc.
2. B-Line Systems, Inc.
3. Kinetics Noise Control.
4. Mason Industries.
5. Vibration Mountings & Controls, Inc.
6. Vibro-Acoustics, Inc.

B. Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.
2. Durometer Rating: Minimum 30.
3. Number of Layers: 1 2 3 or 4.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Durometer Rating: Minimum 30.
2. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
3. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Restrained Mounts: All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

E. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to ¼" thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

F. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to ¼" thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

G. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.

2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of ¼" travel up or down before contacting a resilient collar.

H. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

I. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

J. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

K. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop. Include rod and angle-iron brackets for attaching to equipment.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

L. Pipe Riser Resilient Support : All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

M. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers:

1. Amber/Booth Company, Inc.
2. Cooper B-Line, Inc.; a division of Cooper Industries.
3. Hilti, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Unistrut; Tyco International, Ltd.
7. Vibro-Acoustics, Inc.

B. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum ¼" air gap, and minimum ¼" thick resilient cushion.

D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

E. Restraint Cables: ASTM A 603 galvanized steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

F. Hanger Rod Stiffener: Provide for affected systems steel tube, steel slotted-support-system sleeve with internally bolted connections, or reinforcing steel angle clamped to hanger rod.

G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

J. Mechanical Anchor Bolts for nonisolated equipment in up to 10 hp: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

K. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic and wind control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic- and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry seismic loads within loading limits.

3.3 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements indicated in the Contract Documents, in codes and ordinances, by Authority Having Jurisdiction, and by Manufacturer, for installation of all devices.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Perform tests.

B. Tests:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.

8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Prepare test reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 210548

SECTION 211000 - WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Description of Work:

1. The work includes designing and providing an automatic fire extinguishing system of required hazard for building occupancy to afford complete fire protection coverage throughout. The design, equipment, materials, installation and workmanship shall be in strict accordance with the Owners insurance underwriters requirements, the Virginia Uniform Statewide Building Code, and the required and advisory provisions of NFPA.

2. Unless otherwise indicated piping shall not be run in spaces containing electrical equipment in the form of transformers, panel-boards, switchgear, or computer servers.
   a. Exceptions:
      1) Personal computers (PC,s)
      2) Spaces whose name does not include the term "Electrical", "Data", or "Computer"

3. Each system shall include materials, accessories and equipment necessary to provide each system complete and ready for use.

4. The design of each system shall give full consideration to blind spaces, piping, electrical equipment, ductwork, and all other construction and equipment to afford complete coverage.

5. Devices and equipment for fire protection service shall be of an approved make and type listed by the Underwriters' Laboratories, Inc., or approved by the Factory Mutual System.

6. In the publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears.

7. Reference to the "authority having jurisdiction" shall be interpreted to mean the Local Fire Marshal..

8. The work shall begin outside the building at a point five feet from the exterior surface of the wall at the location indicated on the drawings.

9. Calculations shall include delivering water from the point of the fire hydrant flow test through the site piping.

10. Consideration shall be given to all unheated areas such as attics, utility rooms, loading docks, outdoor storage spaces with canopies, etc., to provide freeze protection in accordance with NFPA 13. This shall include the installation of dry sprinklers or dry-pipe sprinkler systems where necessary.

1.3 DEFINITIONS

A. Underground Service-Entrance Piping: Underground service piping below the building.

1.4 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.5 PERFORMANCE REQUIREMENTS

A. Standard Piping System Component Working Pressure: Listed for at least 175 psig.

B. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.

2. Sprinkler Occupancy Hazard Classifications: shall be as indicated on the drawings.

3. Minimum Density for Automatic-Sprinkler Piping Design:

   a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. (6.3 mL/s over 139-sq. m) area.
   b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. (9.5 mL/s over 139-sq. m) area.
   c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. (12.6 mL/s over 139-sq. m) area.

4. Maximum Protection Area per Sprinkler: Per UL listing.

5. Maximum Protection Area per Sprinkler:

   a. Office Spaces: 225 sq. ft. (20.9 sq. m).
   b. Storage Areas: 130 sq. ft. (12.1 sq. m).
   c. Mechanical Equipment Rooms: 130 sq. ft. (12.1 sq. m).

d. Electrical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
e. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.

C. Seismic Performance: Fire-suppression piping shall be capable of withstanding the effects of earthquake motions determined according to NFPA 13

D. Seismic Performance: Fire-suppression piping shall be capable of withstanding the effects of earthquake motions determined according to ASCE 7-22, "Minimum Design Loads for Buildings and Other Structures": Section 13.6.8.3 .

1.6 SUBMITTALS

A. Product Data: For the following:

1. Piping materials, including flexible connections, and sprinkler specialty fittings.
2. Pipe hangers and supports, including seismic restraints.
3. Valves, including listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim.
4. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
5. Fire hydrants.
6. Fire department connections, including type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
7. Alarm devices, including electrical data.
8. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable Victaulic style number.

B. Fire-hydrant flow test report.

Approved Sprinkler Piping Shop Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations. Diagram power, signal, and control wiring.

1. Include shop drawings indicating location of all sprinkler heads and all other construction that penetrates ceilings, including light fixtures, HVAC equipment, speakers, fire alarm devices, partition assemblies, etc.
2. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or Model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.

C. Welding certificates.

D. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.7 CLOSEOUT SUBMITTALS

1. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13**.** Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. A Professional Engineer registered in the state where the project is constructed shall stamp and seal the Shop Drawings.

B. Flow test:

1. Bid shall be based on the indicated fire-hydrant flow and pressure.

2. Design calculations shall be based on the results of a confirming fire-hydrant flow test performed or caused to be performed by the contractor within 12 months of submission of shop level drawings for approval.

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

D. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.
2. Any couplings requiring a torque wrench, per manufacturer installation instruction, must have a test tag attached to each bolt showing torque used for each. Tags shall be date stamped and initialed by the installer.

E. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, 2019 edition, "Installation of Sprinkler Systems."

1.9 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Coordination for exposed sprinkler piping:

1. The intent for this coordination is to reduce the visibility of exposed sprinkler piping within exposed spaces. The shop drawings shall identity exposed areas to eliminate exposed sprinkler piping as much as possible.
2. For clear stories: Coordinate Sprinkler piping to avoid piping be installed in front of glazing assemblies. Where routing shall be in between windows or in front of mullions for a neat exposed appearance approved by Architect.
3. For roof height elevation changes in exposed areas: Limit Sprinkler piping to 1 or 2 locations within a single open space to reduce visibility of vertical piping. Sprinkler mains shall not be routed in exposed areas unless required. If required the main locations shall be coordinated with Architect.
4. Where vertical exposed piping occurs the piping shall be installed along the wall and in the corner to reduce visibility.

1.10 SPRINKLER CABINET(S) AND SPARE SPRINLKERS

A. Provide finished, wall-mounted, steel sprinkler cabinet with hinged cover.

B. Provide minimum of six spare sprinklers and sprinkler wrench in cabinet.

C. Provide number of sprinklers required by NFPA 13.

D. Provide products packaged with protective covering for storage. Identify contents with label.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell end and plain end.

1. Mechanical-Joint, Ductile-Iron Fittings AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron gland, rubber gasket, and steel bolts and nuts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell end and plain end.

1. Push-on-Joint, Ductile-Iron Fittings AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

C. Grooved-End, Ductile-Iron Pipe: AWWA C151, with factory- or field-formed, radius-cut-grooved ends according to AWWA C606.

1. Grooved-Joint Piping Systems:

a. Available Manufacturers:

1) Victaulic Co. of America.

b. Grooved-End Fittings: ASTM A 536, ductile-iron casting with OD matching ductile-iron-pipe OD.
c. Grooved-End-Pipe Couplings: AWWA C606, gasketed fitting matching ductile-iron-pipe OD. Include ductile-iron housing with keys matching ductile-iron-pipe and fitting grooves, prelubricated rubber gasket with center leg, and steel bolts and nuts. Basis of Design: Victaulic Style 31.
d. Grooved-End-Pipe Transition Coupling: UL 213 and AWWA C606, gasketed fitting with end matching ductile-iron-pipe OD and end matching steel-pipe OD. Include ductile-iron housing with key matching ductile-iron-pipe groove and key matching steel-pipe groove, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts. Basis of Design: Victaulic Style 307.

2.2 STEEL PIPE AND FITTINGS

A. Threaded-End, Schedule 40 Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed threaded ends.

1. Cast-Iron Threaded Flanges: ASME B16.1.
2. Malleable-Iron Threaded Fittings: ASME B16.3.
3. Gray-Iron Threaded Fittings: ASME B16.4.
4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.
5. Steel Threaded Couplings: ASTM A 865.

B. Plain-End, Schedule 40 Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795.

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
2. Steel Flanges and Flanged Fittings: ASME B16.5.

C. Grooved-End, Schedule 40 Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed, square-cut- or roll-grooved ends.

1. Grooved-Joint Piping Systems:

a. Available Manufacturers:

1) Victaulic Co. of America.

b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD. In applicable sizes, fittings shall be short-pattern, with flow equal to standard pattern fittings. Victaulic FireLock.
c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and ASTM A449 compliant steel bolts and nuts.

1) Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with NFPA-13, fully installed at visual pad-to-pad offset contact. Installation-Ready for complete installation without field disassembly. Basis of Design: Victaulic Style 009N and 107N.
   a) Installation Ready™ rigid single-bolt coupling, Victaulic Style 109, in sizes NPS 1-1/4 (DN32) through NPS 2-1/2 (DN65).

2) Flexible Type: For use in locations where vibration attenuation and stress relief are required: Basis of Design: Victaulic Installation-Ready Style 177 or Style 77.

3) Installation ready gaskets are center-leg, with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth.

d. Installation-Ready™ fittings for Schedule 40 grooved end steel piping in fire protection applications sizes NPS 1-¼ thru 2½ (DN 32 thru DN 65). Fittings shall consist of a ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, [orange enamel coated] [red enamel coated] [galvanized]. Fittings complete with prelubricated Grade "E" EPDM Type 'A' gasket; and ASTM A449 electroplated steel bolts and nuts. System shall be UL listed for a working pressure of 300 psi (2065 kPa) and FM approved for working pressure 365 psi (2517kPa).

1) Victaulic FireLock IGS System with "Installation-Ready™ fittings and couplings may be used for NPS 1 (DN 25) Schedule 10 and Schedule 40 carbon steel pipe in fire protection applications. System rated for a working pressure to 365 psi (2517 kPa).
2) Groove: IGS "Innovative Groove System" groove with shortened "A" dimension and tapered groove backside for ease of installation.
3) Grooving Tool: Victaulic RG2100, with IGS Confirmation Gauge.

D. Grooved-End, Schedule 10 Steel Pipe: Schedule 10 in NPS 5 (DN 125) and smaller; and NPFA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250); with factory- or field-formed, roll-grooved ends.

1. Grooved-Joint Piping Systems:

a. Manufacturers:
   1) Victaulic Co. of America.

b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD. In applicable sizes, fittings shall be short-pattern, with flow equal to standard pattern fittings. Victaulic FireLock.

c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and ASTM A449 compliant steel bolts and nuts.

1) Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with NFPA-13, fully installed at visual pad-to-pad offset contact. Installation-Ready for complete installation without field disassembly. Basis of Design: Victaulic Style 009N and 107N.
   a) Installation Ready™ rigid single-bolt coupling, Victaulic Style 109, for sizes [cULus, FM], in sizes NPS 1-1/4 (DN32) through NPS 2-1/2 (DN65) sizes.

2) Flexible Type: For use in locations where vibration attenuation and stress relief are required: Basis of Design: Victaulic Installation-Ready Style 177 or Style 77.

3) Installation ready gaskets are center-leg, with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth.

d. Installation-Ready™ fittings for Schedule 10 grooved end steel piping in fire protection applications sizes NPS 1-¼ thru 2½ (DN 32 thru DN 65). Fittings shall consist of a ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, [orange enamel coated] [red enamel coated] [galvanized]. Fittings complete with prelubricated Grade "E" EPDM Type 'A' gasket; and ASTM A449 electroplated steel bolts and nuts. System shall be UL listed for a working pressure of 300 psi (2065 kPa) and FM approved for working pressure 365 psi (2517kPa).
   1) Victaulic FireLock IGS System with "Installation-Ready™ fittings and couplings may be used for NPS 1 (DN 25) Schedule 10 and Schedule 40 carbon steel pipe in fire protection applications. System rated for a working pressure to 365 psi (2517 kPa).
   2) Groove: IGS "Innovative Groove System" groove with shortened "A" dimension and tapered groove backside for ease of installation.

e. In lieu of rigid pipe offsets or return bends for sprinkler drops, the Victaulic VicFlex™ Multiple-Use Flexible Stainless Steel Sprinkler Drop System [with captured coupling Style 108] may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel Male threaded nipple or Victaulic FireLock IGS Groove Style 108 coupling for connection to branch-line piping, and a zinc plated steel reducer with a female thread for connection to the sprinkler head.

2. The drop shall include a UL approved Series AH1 with 3" bend radius; AH2 or AH2-CC braided hose with a bend radius to 2" to allow for proper installation in confined spaces.

~~3.~~ Union joints shall be provided for ease of installation.

~~4.~~ The flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 or AB2 bracket. The bracket shall allow installation before the ceiling tile is in place.

1) Grooving Tool: Victaulic RG2100, with IGS Confirmation Gauge.

2.3 FLEXIBLE CONNECTORS

A. Flexible connectors shall have materials suitable for system fluid. Include 175-psig minimum working-pressure rating and ends according to the following:

1. NPS 2 and Smaller: grooved.
2. NPS 2-1/2 (DN 65) and Larger: grooved.
3. Option for NPS 2-1/2 and Larger: Grooved for use with grooved-end-pipe couplings.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company AH2CC.

C. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

2.4 CORROSION-PROTECTIVE ENCASEMENT FOR PIPING

A. Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

2.5 SPRINKLER SPECIALTY FITTINGS

A. Sprinkler specialty fittings shall be UL listed or FMG approved, with 175-psig (1200-kPa) minimum working-pressure rating, and made of materials compatible with piping.

B. Outlet Specialty Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company.
2. Mechanical-T and -Cross Fittings: UL 213, ductile-iron housing with gaskets, bolts and nuts, and threaded, locking-lug, or grooved outlets. Basis of design Victaulic style 920/920N and style 922.
3. Snap-On and Strapless Outlet Fittings: UL 213, ductile-iron housing or casting with gasket and threaded outlet. Basis of design Victaulic style 923.

C. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or locking-lug inlet and outlet, test valve, and orifice and sight glass.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company.

2.6 LISTED FIRE-PROTECTION VALVES

A. Valves shall be UL listed or FMG approved, with 175-psig minimum pressure rating.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company.

B. OS&Y Gate Valves: UL 262.

1. Ductile-iron body with flanged x Groove or groove x groove ends. No Flange x Flange will be accepted.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company or engineer approved equal. Basis of design Victaulic model 771H or 771F.

C. Ball Valves: Comply with UL 1091, except with ball instead of disc.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company.

2. NPS 1-1/2 and Smaller: Bronze body with grooved ends. Basis of Design: Victaulic Series 728.
3. NPS 2 and NPS 2-1/2: ductile-iron body with grooved ends.
4. NPS 3: Ductile-iron body with grooved ends.

D. Butterfly Valves: UL 1091.

1. NPS 2 and Smaller: Bronze body with grooved ends.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company.

2. NPS 2-1/2 and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged or grooved ends. Valve seat shall be pressure-responsive, and the stem offset from the disc centerline to provide complete 360-degree circumferential seating. Basis of Design: Victaulic Series 705. Each valve must be individually tested at factory to include electronics.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company.

E. Check Valves NPS 2 and Larger: UL 312, spring-assisted swing type for vertical or horizontal installation, cast- ductile iron body with flanged or grooved ends. Basis of Design: Victaulic Series 717.

F. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.

1. Indicator: Weatherproof actuator housing with electrical, 15 amp @125-VAC 60 HZ, prewired, single-pole-single-throw, supervisory switches
2. NPS 2 and Smaller: Ball or butterfly valve with bronze body with grooved ends. Basis of Design: Victaulic Series 728.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company.

3. NPS 2-1/2 and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company.

G. Double Check Backflow Preventers:

1. Manufacturers including but not limited to: All Backflow preventers must have Grooved ends and utilize Victaulic OS&Y valves.

a. Ames Co.
b. Conbraco.
c. Febco.
d. Apollo Valves - Apollo Valves - Conbraco Industries, Inc.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1015

3. Application: continuous-pressure.

4. Pressure Loss: per manufacturer.

5. Size: ¾" thru 10" as required to match connected piping.

6. Body: Brass or bronze for NPS 2 and smaller; cast iron or steel with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.

7. Configuration: As needed for installation.

8. Accessories:

a. Valves: Ball type with threaded ends on inlet and outlet of 2" and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of 2 ½" and larger.

2.7 GENERAL-DUTY VALVES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company.

B. Ball Valves NPS 2 and Smaller: MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig minimum CWP rating, blowout-proof stem, and threaded ends.

C. Check Valves NPS 2 and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

D. Globe Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

2.8 SPECIALTY VALVES

A. Sprinkler System Control Valves: UL listed or FMG approved, cast- or ductile-iron body with flanged or grooved ends, and 175-psig minimum pressure rating.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company or engineer approved equal

2. Riser Check Valves: UL 193, designed for horizontal or vertical installation, with bronze grooved seat with O-ring seals, single-hinge pin, and latch design. Include trim sets for drain and pressure gages.
3. Floor control valve assemblies: Universal Manifold Check Valve | Model UMC Model UMC - 1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 6, and 8-inch Universal Manifold Check Valve: Where universal manifold check valves are specified for use in wet-pipe sprinkler systems, as floor control manifolds they shall be specifically listed for such use. Universal manifold check valves shall be ductile iron construction, incorporating a control valve, check valve, flow switch, test & drain assembly, adjustable relief valve, and system gauges in one compact body/footprint, and shall be manufactured for "right" and "left"-hand orientations. The test & drain assemble shall contain an adjustable relief valve, with a range of 175 to 310 psi, and a universal test orifice of K2.8; to provide testing capabilities of systems with k-factors ranging from K2.8 and larger. The Universal Manifold Check valve shall be rated for use at the maximum service pressure of 300 psi and shall be UL listed and FM approved. Universal manifold check valves shall be the Model UMC; as manufactured by Globe brand by Victaulic Company.

2.9 SPRINKLERS

A. Sprinklers shall be UL listed or FMG approved, with 175-psig minimum pressure rating. Basis of design Victaulic/Globe.

B. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company or engineer approved equal

C. Automatic Sprinklers: UL-Listed with quick response glass bulb type heat-responsive element complying with the following:

1. UL 199, for nonresidential applications.

D. Wrenches shall be provided by the sprinkler manufacturer that directly engage the hex-shaped wrench boss integrally cast in the sprinkler body.

E. Sprinkler types, features, and options as follows:

1. Brass upright sprinklers.
2. Extended-coverage sprinklers.
3. Concealed pendent sprinklers, including cover plate.
4. Pendent sprinklers.
5. Pendent, dry-type sprinklers.
6. Quick-response sprinklers.
7. Recessed sprinklers, including escutcheon.
8. Sidewall sprinklers.
9. Sidewall, dry-type sprinklers.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: 2 piece, with 1-inch vertical adjustment.
2. Sidewall Mounting: 2 piece, with 1-inch horizontal adjustment.

G. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

H. In lieu of rigid connections to dry sprinkler heads, a Victaulic VicFlex™ dry sprinkler, Model VS1, may be used. The sprinkler shall provide a vertical or horizontal flexible connection with a bend radius to 2" and allow for up to 4 bends.

I. For cooler or Freezer boxes: Victaulic AB6 Freezer dry pendant utilizing a flexible hose connection shall be used. No dry Pendant utilizing a rubber boot will be allowed.

J. For Vestibules: Install dry type horizontal sidewall sprinklers if not conditioned.

2.10 FIRE DEPARTMENT CONNECTIONS

A. Manufacturers:

1. Central Sprinkler Corp.
2. Elkhart Brass Mfg. Co., Inc.
3. Fire-End and Croker Corp.
4. Guardian Fire Equipment Incorporated.
5. Potter-Roemer; Fire-Protection Div.

B. Remote, Freestanding Fire Department Connection: UL 405, 175-psig minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass wall escutcheon plate, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to "AUTO SPKR & STANDPIPE."

1. Type: Freestanding
2. Finish: Chrome plated.

2.11 TEST HEADER FOR BACKFLOW PREVENTER

A. Manufacturers:

1. Elkhart Brass Mfg. Co., Inc.
2. Fire-End and Croker Corp.
3. Guardian Fire Equipment Incorporated.
4. Potter-Roemer; Fire-Protection Div

B. Hose Valve Manifold Assembly:

1. Header Pipe: Schedule 40, steel or ductile iron.
2. Header Pipe Fittings: galvanized cast-iron threaded fittings.
3. Automatic Drain Valve: UL 1726
4. Hose Valves: UL 668, straightway pattern, chrome plated with cap and chain. Include NFPA 1963 hose thread that complies with local fire department standards and finish same as for test-header-manifold escutcheon plate.
5. Nipples: Schedule 40 galvanized-steel pipe with threaded ends.
6. Caps with Chain: Chrome plated with threaded outlet.
7. Escutcheon Plate: Chrome plated, rectangular.
8. Exposed Parts Finish: Chrome plated.
9. Escutcheon Plate Marking: "BKFL TEST CONN"

2.12 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Wet Pipe Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

1. Available Manufacturers:

a. Grinnell Fire Protection.
b. ITT McDonnell & Miller.
c. Potter Electric Signal Company.
d. Viking Corp.
e. Watts Industries, Inc.; Water Products Div.
f. Viking Corp.

C. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

1. Available Manufacturers:

a. McWane, Inc.; Kennedy Valve Div.
b. Potter Electric Signal Company.
c. System Sensor.

D. Indicator-Post Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

1. Available Manufacturers:

a. Potter Electric Signal Company.
b. System Sensor.

F. Outside Electric Bell: UL 753, 120VAC with weatherproof backbox.

1. Available Manufacturers:

a. Notifier
b. Potter Electric Signal Company.
c. System Sensor.

2. .

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 EARTHWORK

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.3 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 PIPING APPLICATIONS, GENERAL

A. Shop-weld pipe joints where welded piping is indicated.

B. Do not use welded joints for galvanized-steel pipe.

C. Flanges, flanged fittings, unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

D. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints or grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

E. Underground Service-Entrance Piping: Ductile-iron, mechanical-joint pipe and fittings and restrained joints. Include corrosion-protective encasement**.**

3.5 SPRINKLER SYSTEM PIPING APPLICATIONS

A. Standard-Pressure, Wet-Pipe Sprinkler System, 175-psig (1200-kPa) Maximum Working Pressure:

1. Sprinkler-Piping Fitting Option: Specialty sprinkler fittings, NPS 2 and smaller, including mechanical-T and -cross fittings, may be used downstream from sprinkler zone valves.
2. Sprinkler Piping NPS 2" and smaller use any of the following:
   a. Threaded-end, black, schedule 40 steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
   b. Plain-end, black, schedule 40 steel pipe; steel welding fittings; and welded joints.
   c. Grooved-end, black, schedule 40 steel pipe with square-cut- or roll-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
3. Sprinkler Piping NPS 2 ½" and larger use any of the following:
   a. Threaded-end, black, schedule 40 steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
   b. Plain-end, black, schedule 10 steel pipe; steel welding fittings; and welded joints.
   c. Grooved-end, black, Schedule 10 steel pipe; grooved-end fittings; grooved-end-pipe couplings; and roll grooved joints.

3.6 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Listed Fire-Protection Valves: UL listed and FMG approved for applications where required by NFPA 13

   a. Shutoff Duty: Use ball, butterfly, or gate valves.

2. Unlisted General-Duty Valves: For applications where UL-listed and FMG-approved valves are not required by NFPA 13.

a. Shutoff Duty: Use ball, butterfly, or gate valves.
b. Throttling Duty: Use ball or globe valves.

3.7 JOINT CONSTRUCTION

A. Refer to Division 21 Section "Common Work Results for Fire Suppression" for basic piping joint construction.

B. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 (DN 200) with wall thickness less than Schedule 40 unless approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.

C. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts.

1. Ductile-Iron Pipe: Radius-cut-groove ends of piping. Use grooved-end fittings and grooved-end-pipe couplings.
2. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.

D. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials.

1. NPS 2 and Smaller: Use dielectric unions, couplings, or nipples.
2. NPS 2-1/2 to NPS 4: Use dielectric flanges.
3. NPS 5 and Larger: Use dielectric flange insulation kits.

3.8 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression piping to water-service piping of size and in location indicated for service entrance to building. Refer to Division 22 Section "Facility Water Distribution Piping" for exterior piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Refer to Division 22 Section "Facility Water Distribution Piping" for backflow preventers.

3.9 WATER-SUPPLY CONNECTION

A. Connect fire-suppression piping to building's interior water distribution piping. Refer to Division 22 Section "Domestic Water Piping" for interior piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping. Refer to Division 22 Section "Domestic Water Piping Specialties" for backflow preventers.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.10 PIPING INSTALLATION

A. Refer to Division 21 Section "Common Work Results for Fire Suppression" for basic piping installation.

B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Piping shall be exposed in spaces without ceilings only if supplying sprinklers in the same space.

2. The only piping allowes over rooms containing electrical equipment in the form of , transformers, panelboards, switchgear, or computer servers shall be pipes serving sprinklers within each electrical equipment space.
   a. Exception:
      1) Generator or transformer rooms separated from the remainder of the building by walls and floor/ceiling or roof/ceiling assemblies having a fire-resistance rating of not less than two hours shall not require sprinkler coverage provided that such rooms are protected with an approved automatic fire detection system.

3. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

C. Install underground ductile-iron service-entrance piping according to NFPA 13 and NFPA 24 and with restrained joints. Encase piping in corrosion-protective encasement.

D. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.

F. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13. Test connections that discharge to the exterior shall discharge 1'-0" above a concrete splash block. Provide splash block under this section of the specifications.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

K. Install alarm devices in piping systems.

L. Hangers and Supports: Comply with NFPA 13 and "Hanger and Supports for Fire-Suppression Piping" for hanger materials.

1. Install sprinkler system piping according to NFPA 13.

M. Earthquake Protection: Install piping according to ASCE 7-22, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

N. Earthquake Protection: Install piping according to NFPA 13 to protect from earthquake damage.

O. Install pressure gages on riser or feed main, at each sprinkler test connection. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they will not be subject to freezing.

P. Fill wet-pipe sprinkler system piping with water.

3.11 VALVE INSTALLATION

A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Valves for Wall-Type Fire Hydrants: Install nonrising-stem gate valve in water-supply pipe.

D. Install backflow preventer in potable-water supply sources.

E. Specialty Valves:

1. Alarm Check Valves: Install in vertical position for proper direction of flow, including bypass check valve and retarding chamber drain-line connection.

3.12 SPRINKLER APPLICATIONS

A. Drawings indicate sprinkler types to be used. Where specific types are not indicated, use the following sprinkler types:

1. Rooms without Ceilings: Upright sprinklers.

2. Rooms with Suspended Ceilings: Recessed pendent sprinklers unless otherwise indicated then concealed sprinklers as indicated.
3. Wall Mounting: Recessed Sidewall sprinklers.
4. Spaces Subject to Freezing: Upright, dry pendent, dry sidewall sprinklers as indicated.
5. Special Applications: Extended-coverage, flow-control, and quick-response sprinklers where indicated or required**.**
6. Sprinkler Finishes:

    a. Upright, Pendent, and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.
    b. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
    c. Flush Sprinklers: Bright chrome, with painted white escutcheon.
    d. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

3.13 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings centered both ways in acoustical ceiling panels and tiles.

B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space wherever possible. Otherwise, use dry-pipe systems.

3.14 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install freestanding-type, fire department connections in level surface.

1. Install protective pipe bollards on two sides of each fire department connection. Refer to Division 05 Section "Metal Fabrications" for pipe bollards.

B. Install ball drip valve at each check valve for fire department connection.

3.15 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping. Refer to Division 22 Section "Domestic Water Piping Specialties" for backflow preventers.

D. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.

E. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

F. Electrical Connections: Power wiring is specified in Division 26.

G. Coordinate connection of alarm devices to fire alarm.

H. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

I. Coordinate connection of wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

J. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.16 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and "Common Work Results for Fire-Suppression" for piping identifications.

3.17 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Energize circuits to electrical equipment and devices.
4. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
5. Coordinate with fire alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire department equipment.

B. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.18 CLEANING AND PROTECTION

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

C. Protect sprinklers from damage until Substantial Completion.

D. Protect the exterior of the building when operating drains and test connections that discharge to the exterior.

E. Dirt and stains on any surfaces resulting from the work of this section of the specifications shall be cleaned and removed under this section of the specifications.

3.19 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves. Refer to Division 01 Section "Closeout Procedures".

END OF SECTION 211000

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.

4. Escutcheons.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to Division 23 Hydronic Piping or pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 23 piping sections for joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions inside & outside pipe and:

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is otherwise indicated.

   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated, and full-face or ring type, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free (95% Tin, 5% Antimony) alloy. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
3. PVC to ABS Piping Transition: ASTM D 3138.

2.3 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Available Manufacturers:

   a. Cascade Waterworks Mfg. Co.
   b. Dresser Industries, Inc.; DMD Div.
   c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
   d. JCM Industries.
   e. Smith-Blair, Inc.
   f. Viking Johnson.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.

3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Available Manufacturers:

a. Eslon Thermoplastics.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150 or 300 psig working pressure where required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.9 SECURITY FASTENERS:

A. Description: Accessories, anchorage inserts, and security fasteners providing a complete tamperproof installation.

B. Exposed Security Fasteners:
1. Fastener: Provide torx-head (star with center reject pin) security fasteners for anchoring work in exposed security areas.
2. Finish: Finish shall match that specified of the item anchored.
3. Tools: Provide tools for fastening devices

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type with spring clips.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves aboveground are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through walls, floors, or roofs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves as walls and slabs are constructed.

a. PVC Pipe Sleeves: For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

3. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Section "Penetration Firestopping" for materials.

S. Verify final equipment locations for roughing-in.

T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 HOUSEKEEPING PADS AND EQUIPMENT PADS

A. Housekeeping pads and equipment pads: Anchor equipment to concrete according to equipment manufacturer's written instructions and according to seismic codes at project location.

1. Construct concrete pads in accordance with drawing details.
2. Details may be found on structural drawings. If details are not provided comply with the following:
    a. Housekeeping pads inside the building shall be 4” thick and 6” larger all around than supported equipment. Provide a 1” chamfer on all edges.
    b. If details are not provided, equipment pads outside the building shall be 8” thick with a 24” deep 12” wide turndown (footing) all around the outside edge of the pad. Provide welded wire mesh reinforcement. Pad shall be 12” larger all around than supported equipment.
    c. Install dowel rods to connect housekeeping pad to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the pad. Provide a 1” chamfer on all edges.
    d. Install epoxy-coated anchor bolts. For equipment on housekeeping pads bolts shall extend through housekeeping pad, and anchor into structural concrete floor.

e. Place and secure anchor bolts using supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions for placement.
f. Install anchor bolts to elevations required for proper attachment to supported equipment.
g. Install anchor bolts according to anchor bolt manufacturer's written instructions.
h. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section "Cast-in-Place Concrete".

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.8 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 220500

SECTION 220516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Maintenance Data: For expansion joints to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PACKLESS EXPANSION JOINTS

A. Flexible-Hose Packless Expansion Joints:

1. Available Manufacturers:

a. Flex-Hose Co., Inc.
b. Flexicraft Industries.
c. Flex Pression Ltd.
d. Metraflex, Inc.
e. Unisource Manufacturing, Inc.

2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.

4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.

    a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.

5. Expansion Joints for Copper Tubing 2-1/2" to 4": Copper-alloy fittings with threaded end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.

2.2 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Available Manufacturers:

    a. Adsco Manufacturing LLC.
    b. Advanced Thermal Systems, Inc.
    c. Flex-Hose Co., Inc.
    d. Flexicraft Industries.
    e. Flex-Weld, Inc.
    f. Hyspan Precision Products, Inc.
    g. Metraflex, Inc.
    h. Unisource Manufacturing, Inc.

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Stud: Threaded, zinc-coated carbon steel.
    b. Expansion Plug: Zinc-coated steel.
    c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.

b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

C. Install rubber packless expansion joints according to FSA-NMEJ-702.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Connect risers and branch connections to mains with a minimum of 5 (five) pipe fittings including tee in main.

B. Connect risers and branch connections to terminal units with a minimum of 4 (four) pipe fittings including tee in riser.

C. Connect mains and branch connections to terminal units with a minimum of 4 (four) pipe fittings including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install two guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four Insert number pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 220516

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of one piece cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

A. Available Manufacturers:

1. Smith, Jay R. Mfg. Co.
2. Wade
3. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. GPT, EnPro Industries
    d. Metraflex Co.
    e. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide ¼” clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants.

E. Fire Ratings: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide ¼" clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Division 07 Section "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire Rating: Maintain indicated fire rating at pipe penetrations. Seal pipe penetrations with firestop materials.

3.3 SLEEVE-SEAL SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building unless otherwise indicated.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade, below Grade, Concrete Slabs-on-Grade, and Concrete Slabs above Grade:
    a. Piping Smaller Than 6": Cast-iron wall sleeves with sleeve-seal system.
        1) Select sleeve size to allow for one inch (1") annular clear space between piping and sleeve for installing sleeve-seal system.
    b. Piping 6" and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

END OF SECTION 220517

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Schedule for thermometers and gages indicating manufacturer's number, scale range, and location for each.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers:

    a. Flo Fab Inc.
    b. Miljoco Corporation.
    c. Palmer Wahl Instrumentation Group.
    d. Tel-Tru Manufacturing Company.
    e. Trerice, H. O. Co.
    f. Weiss Instruments, Inc.
    g. Winters Instruments - U.S.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in degrees F.
7. Window: Glass

8. Stem: Aluminum length = 1/2 pipe diameter, 1/2 duct width or 12” whichever is less.

    a. Air-Duct Installation: Provide ventilated shroud.
    b. Thermowell Installation: Provide Bare stem.

9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into threaded fitting.
3. Material: Brass.
4. Type: Stepped shank unless straight or tapered shank is indicated.
5. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
6. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
7. Bore: Diameter required to match thermometer bulb or stem.
8. Insertion Length: Length required to match thermometer bulb or stem.
9. Lagging Extension: Include on thermowells for insulated piping and tubing.
10. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

2.3 PRESSURE GAGES

A. Available Manufacturers:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
4. Miljoco Corporation

B. Direct or remote-Mounting, Dial-Type Pressure Gages: Indicating-dial type.

1. Case: Rear flange dry type, drawn steel or cast aluminum, 4-1/2-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Red or other dark-color metal.
7. Window: Glass or acrylic.
8. Ring: Stainless steel or brass.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:
1. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.4 TEST PLUGS

A. Available Manufacturers:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
4. Miljoco Corporation

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for water service at 20 to 200 deg F shall be CR.
2. Insert material for water service at minus 30 to plus 275 deg F shall be EPDM.

2.5 ISOLATION VALVES

A. Available Manufacturers:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
4. Miljoco Corporation.

B. Description: Brass ball valve or 316 stainless steel needle valve.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install remote-mounting dial thermometers on panel, with tubing connecting panel and thermometer bulb supported to prevent kinks. Use minimum tubing length.

C. Install thermowells with socket extending to center of pipe and in vertical position in piping tees for each gauge and thermometer.

D. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

E. Install needle-valve and snubber fitting in piping for each pressure gage.

F. Install test plugs.

G. Adjust faces of thermometers and gages to for proper visibility as judged by the architect.

END OF SECTION 220519

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene plastic.

G. RS: Rising stem.

H. SWP: Steam working pressure.

I. TFE: Tetrafluoroethylene plastic.

J. WOG: Water Oil Gas.

1.3 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include furnished specialties and accessories.

1.4 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.

3. ASME B31.9 for building services piping valves.

    a. Exceptions: Domestic hot- and cold-water valves unless referenced.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Bronze & Brass: Shall be dezincification resistant. (Zinc content shall be less than 15%)

C. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

D. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

E. Valve Pressure and Temperature Ratings: Match system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. As specified in other Part 2 articles.
2. Where required in Part 3 articles, provide a chain actuator in lieu of the operator specified in other Part 2 articles.

3. Chain Operator: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.
5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

H. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

I. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.2 COPPER-ALLOY BALL VALVES

A. Two-Piece, Copper-Alloy Ball Valves (Full Port):

1. NIBCO Model 585-70-66 (Uninsulated piping)
2. NIBCO Model 585-70-66NS or approved alternative (Insulated piping)
3. Other Manufacturers:
   a. Milwaukee
   b. Conbraco Industries, Inc.; Apollo Div.

4. Handle Nut: 300 series stainless steel.
5. Handle: Zinc plated steel, clear chromate, plastic coated.
6. Threaded Pack Gland: Brass ASTM B-16 Alloy 360
7. Packing: TFE
8. Stem (Blowout Proof): ASTM A-276 type 316 stainless steel. Where piping is insulated provide 2" extended handles of non-thermal conductive material. Also provide a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Memory stops, which are fully adjustable after insulation is applied, shall be included.
9. Thrust Washer: Reinforced TFE
10. Ball: Full-port, ASTM A-276 Type 316 stainless steel.
11. Seats: Reinforced TFE
12. Body: Bronze ASTM B-584 alloy 844 for solder or threaded connection.
13. Body End Piece: Bronze ASTM B-584 alloy 844 for solder or threaded connection.
14. Rating: 150 psig saturated steam, 600 psig non-shock cold water, oil, and gas.
15. Conform To: MSS SP-110

2.3 MOTORIZED BALL VALVES

A. Electrically Operated Valves: Comply with UL 429.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ASCO Power Technologies, LP; Division of Emerson. Model 8210
    b. Magnatrol Valve Corporation.
    c. Parker Hannifin Corporation; Climate & Industrial Controls Group; Skinner Valve Div.
    d. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
    e. Valworx Inc.Valves &Controls.

2. Pilot operated.
3. Body: Brass or aluminum.
4. Seats and Disc: Nitrile rubber.
5. Springs and Valve Trim: Stainless steel.
6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

2.4 FERROUS-ALLOY BUTTERFLY VALVES

A. General: Butterfly valves shall provide bi-directional bubble tight dead end service without a downstream flange.

B. Wafer-lug type butterfly valves:

1. NIBCO Model LD 2000
2. Other Manufacturers:
    a. Stockham
    b. Demco

3. Stem: ASTM A-582 Type 416 Stainless steel.
4. Collar Bushing: ASTM B-124 Brass.
5. Stem Seal: EPDM Rubber
6. Body Seal: EPDM Rubber
7. Upper Bushing: CDA 122 Copper
8. Liner: EPDM Rubber
9. Disc: ASTM B-148 alloy 954/955 aluminum bronze.
10. Lower Bushing: CDA 122 copper.
11. Body Wafer: ASTM A-536 Ductile Iron or ASTM A-126 CL. B cast iron.
12. Body Lug: ASTM A-536 Ductile Iron or ASTM A-126 CL. B cast iron.
13. Rating: 200 psig CWP.
14. Conform To: MSS SP-67, MSS SP-25, API-609
15. Operator:
    a. Valves up to and including 6”: Lever-lock operator.

b. Valves 8” and larger: Self locking worm gear operator equipped with adjustable stops at open and shut positions.

C. Grooved-End 300 psig butterfly valves:

1. NIBCO Model GD 4765
2. Other Manufacturers:
   a. Victaulic

3. Upper Stem: ASTM A-582 Type 416 Stainless steel.
4. Upper Bearing: Split metal.
5. O-Ring: EPDM
6. Body: ASTM A-395 ductile iron with polyimide coating.
7. Disc: ASTM A-395 ductile iron with EPDM encapsulation.
8. Lower Bearing: Split metal.
9. Dust Plug: PVC
10. Rating: 300 psig CWP.
11. Conform To: MSS SP-67
12. Operator:
    a. Valves up to and including 6”: Lever-lock operator.
    b. Valves 8” and larger: Self locking worm gear operator equipped with adjustable stops at open and shut positions.

D. Flanged 200 psig butterfly valves:

1. NIBCO Model FC-2765-0
2. Upper Stem: ASTM A-582 Type 416 Stainless steel.
3. Upper Bushing: TFE over porous bronze, steel backed.
4. O-Ring: EPDM
5. Body: ASTM A-126 Class B cast iron with polyimide coating.
6. Disc: ASTM A-395 ductile iron with EPDM encapsulation.
7. Lower Bushing: TFE over porous bronze, steel backed.
8. Lower Stem: ASTM A-582 Type 416 Stainless steel.
9. Dust Plug: PVC
10. Rating: 200 psig CWP.
11. Conform To: MSS SP-67 and MSS SP-25
12. Operator:
    a. Valves up to and including 6”: Lever-lock operator.
    b. Valves 8” and larger: Self locking worm gear operator equipped with adjustable stops at open and shut positions.

2.5 BRONZE CHECK VALVES

A. Bronze, Horizontal Swing Check Valves:

1. NIBCO Model 413
2. Other Manufacturers:
   a. Milwaukee
   b. Stockham

3. Bonnet: ASTM B-62 bronze.
4. Body: ASTM B-62 bronze.
5. Hinge Pin: ASTM B-140 alloy C31400 bronze, or B-134 alloy C23000 bronze.
6. Disc Hanger:
   a. Sizes ¼" thru ¾": Type 304 stainless steel.
   b. Sizes 1" and larger: ASTM B-62 bronze.
7. Hanger Nut: ASTM B-16 bronze.
8. Disc Holder: ASTM B-62 bronze.
9. Seat Disc:
   a. Water and Other Heat Transfer Fluids: ASTM B-62 bronze.
   b. Steam: TFE
10. Seat Disc Nut: ASTM B-16 or B-62 bronze.
11. Hinge Pin Plug: ASTM B-140 alloy C31600 bronze.
12. Seat Disc Washer (When Provided): ASTM B-98 alloy C65500 or B-103 bronze.
13. Rating: 125 psig SWP and 200 psig CWP.
14. Conform To: MSS SP-80

B. Bronze, Inline Spring Loaded Check Valves:

1. NIBCO Model 480
2. Other Manufacturers:
   a. Milwaukee
   b. Stockham

3. Body: ASTM B-584 alloy C84400 bronze.
4. Stem: ASTM A-582 alloy C30300 stainless steel.
5. Disc Holder: 316 Stainless steel
6. Disc:
   a. Water, Oil, Gas: Buna-N
   b. Steam: TFE
7. Seat Screw: ASTM A-276 alloy S43000 stainless steel.
8. Body End: ASTM B-584 alloy C84400 bronze.
9. Rating: 125 psig SWP and 250 psig CWP.
10. Conform To: MSS SP-80

2.6 IRON BODY CHECK VALVES

A. Iron Body, Horizontal Swing Check Valves:

1. NIBCO Model 918-B
2. Other Manufacturers:
   a. Milwaukee
   b. Stockham

3. Body Bolt: ASTM A-307 steel.
4. Bonnet: ASTM A-126 class B cast iron.
5. Body Gasket: Synthetic Fibers.
6. Body Nut: ASTM A-307 steel
7. Side Plug: ASTM B-16 alloy C36000 Brass.
8. Hanger Pin: ASTM B-16 alloy C36000 Brass.

9. Hanger: ASTM B-584 alloy C84400 cast bronze.
10. Disc: ASTM B-584 alloy C84400 cast bronze or ASTM A-536 ductile iron w/bronze face ring.
11. Seat Ring: ASTM B-584 alloy C84400 cast bronze.
12. Disc Nut: ASTM B-16 alloy C36000.
13. Body: ASTM A-126 class B cast iron.
14. Disc Bolt: ASTM B-16 alloy C36000 Brass.
15. Disc Plate: ASTM A-126 class B cast iron.
16. Disc Cage: ASTM A-126 class B cast iron.
17. Rating: 125 psig SWP and 200 psig CWP.
18. Conform To: MSS SP-71 Type 1.

B. Grooved-End, Ductile-Iron Spring Assisted Check Valves: Victaulic Series 716 with EPDM disc seal.

C. Spring Actuated Silent Check Valves:

1. NIBCO Model F-910
2. Other Manufacturers:
   a. Milwaukee
   b. Stockham

3. Body: ASTM A48 class 35 cast iron.
4. Seat: ASTM B-584 alloy C83600 (B) bronze.
5. Disc: ASTM B-584 alloy C83600 bronze.
6. Spring: Type 302 ASTM A313 stainless steel.
7. Bushing:
   a. 6” and Smaller: ASTM B-16 brass
   b. 8” and Larger: ASTM B-584 alloy C83600 bronze.
8. Set Screws: Type 304 ASTM A-276 stainless steel.
9. Rating: 200 psig CWP.
10. Conform To: MIL-V-18436F

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for ball, butterfly and gate valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

F. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.
2. Throttling Service: Ball or butterfly valves.
3. Pump Discharge: Spring-loaded, lift-disc check valves and ball or butterfly valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Domestic Water Piping: Use the following types of valves:

1. Valves, NPS 2” and Smaller: Two-Piece, Copper-Alloy Ball Valves (Full Port).
2. Valves, NPS 2-1/2” and 3”:
   a. Two-piece or three-piece, Copper-Alloy Ball Valves (Full Port).
   b. Wafer-Lug, grooved-end, or flanged butterfly valves.
3. Valves, NPS 4” and Larger: Wafer-Lug, grooved-end, or flanged butterfly valves.
4. Pump Discharge Check Valves (Horizontal or Vertical), NPS 2” and Smaller: Bronze, Inline Lift Check Valves.

5. Horizontal Check Valves, NPS 2” and Smaller: Bronze, Horizontal Swing Check Valves.
6. Vertical Check Valves, NPS 2” and Smaller: Bronze, Inline Lift Check Valves.
7. Pump Discharge Check Valves (Horizontal or Vertical), NPS 2-1/2” and Larger: Grooved-End, Ductile-Iron Spring Assisted Check Valves or Spring Actuated Silent Check Valves.
8. Horizontal Check Valves, NPS 2-1/2” and Larger: Bronze, Horizontal Swing Check Valves.
9. Vertical Check Valves, NPS 2-1/2” and Larger: Grooved-End, Ductile-Iron Spring Assisted Check Valves or Spring Actuated Silent Check Valves.

3.5 JOINT CONSTRUCTION

A. Refer to Division 23 Hydronic Piping or pipe, tube, and fitting materials and joining methods.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design Requirement: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer where using methods other than indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test medium.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.4 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

B. Trapeze Pipe Hanger Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

1. Assemble and provide according to manufacturer's written instructions. Center piping on channel to evenly distribute load.

2. Pipe sizes and numbers shall be in accordance with the following:

TRAPEZE PIPE HANGER TABLE

PIPE SIZE	4”	3”	2 ½”	2”	1 ½”	1 ¼”	1”	TOTAL # of PIPES
NUMBER OF PIPES PERMITTED IN ONE CHANNEL SUPPORT	**2**	0	0	0	0	0	0	**2**
	0	**2**	**2**	0	0	0	0	**4**
	0	**2**	0	**4**	0	0	0	**6**
	0	**2**	0	0	**6**	0	0	**8**
	0	0	**4**	**2**	0	0	0	**6**
	0	0	**4**	0	**2**	**2**	0	**8**
	0	0	**4**	0	0	**8**	0	**12**

	0	0	0	**6**	**2**	**2**	**2**	**12**
	0	0	0	**8**	0	**2**	0	**10**
	0	0	0	0	**14**	0	0	**14**
	0	0	0	0	0	**16**	0	**16**

Notes:

1. Piping larger than 4” in diameter is not permitted in a channel support system.
2. Channel support systems shall be limited to eight (8) pipes per channel and two (2) channels (levels) per support system.
3. Smaller pipes can be substituted for larger pipes. For example two ¾” pipes may be installed in lieu of two 1” pipes, or 2” in lieu of 3”, etc.
4. Spacing shall be in accordance with requirements for the smallest supported pipe. Refer to other specification sections for spacing requirements. If spacing requirements are not indicated comply with MSS SP-69.

C. Metal Framing Systems:

1. Available Manufacturers:

   a. Anvil International; a subsidiary of Mueller Water Products Inc.
   b. Empire Industries, Inc.
   c. ERICO International Corporation.
   d. Haydon Corporation; H-Strut Division.
   e. NIBCO INC.
   f. PHD Manufacturing, Inc.
   g. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Zinc.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Available Manufacturers:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.

6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig, ASTM C 552, Type II cellular glass with 100-psig, or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2” beyond sheet metal shield for piping operating below ambient air temperature.

2.4 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

1. Available Manufacturers:

   a. Cooper B-Line – Dura-Blok
   b. MAPA Products
   c. Mifab, Inc. – C-Port
   d. Miro Industries, Inc.
   e. OMG, Inc.
   f. PHP Systems/Design
   g. Pipe Prop
   h. Roof Top Blox

2. Provide pipe supports for supporting gas, condensate, refrigeration lines, or hyrdronic piping on flat roof surfaces. Support shall rest on roof surface without penetrating the roof surface. Supports for condensate piping shall be adjustable vertically to ensure pipe slopes as required.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Curb Mounted Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop or field fabricated equipment support made from structural carbon-steel shapes unless indicated otherwise.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Provide hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69, MSS SP-89, and Table above. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Provide in pipe hanger or shield for insulated piping.

E. Pipe Stand Installation: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

F. Provide hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Provide hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Provide lateral bracing with pipe hangers and supports to prevent swaying.

J. Provide building attachments within concrete slabs or attach to structural steel. Building attachments may not used on steel joists unless otherwise indicated. Provide additional attachments

at concentrated loads, including valves, flanges, and strainers, 2-1/2" and larger and at changes in direction of piping. Provide concrete inserts before concrete is placed; fasten inserts to forms and provide reinforcing bars through openings at top of inserts.

K. Load Distribution: Provide hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Provide hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Provide thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Provide MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

3. Provide MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

4. Shield Dimensions for Pipe: Not less than the following:

    a. Pipe ¼" to 3-½": 12 inches long and 0.048 inch thick.
    b. Pipe 4": 12 inches long and 0.06 inch thick.
    c. Pipe 5" and 6": 18 inches long and 0.06 inch thick.
    d. Pipe 8" to 14": 24 inches long and 0.075 inch thick.

5. Pipes 8" and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Provide with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Provide materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Unless otherwise indicated clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Provide same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and immediately apply galvanizing-repair paint. Paint shall comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Provide hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Provide nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Provide copper-plated pipe hangers and copper attachments for copper piping and tubing.

F. Provide padded hangers for piping that is subject to scratching.

G. Provide thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated provide the following:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of stationary pipes ½" to 30".
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes 4" to 14", requiring up to 4" of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes ¾" to 14", requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes ½" to 14" if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes ½" to 4", to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes ¾" to 8".
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes ½" to 8".
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes ½" to 8".
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes ½" to 8".
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes ½" to 8".
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS ½" to 3".
12. U-Bolts (MSS Type 24): For support of heavy pipes ½" to 14".
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes 4" to 14", with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes 4" to 14", with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes 2-½" to 14" if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes 1" to 14", from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes 2-½" to 14", from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes 2" to 14" if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes 2" to 14" if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes 2" to 14"if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

I. Vertical-Piping Clamps: Unless otherwise indicated provide the following:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers ¾" to 14".

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers ¾" to 14" if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated provide the following:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
6. Flat Plate, Double Nut, and Washer as Detailed on Structural Drawings: For attaching to bar joists. Method of attachment to bar joists must be approved by the structural engineer and joist manufacturer.

K. Building Attachments: Unless otherwise indicated provide the following:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Flat Plate, Double Nuts, and Washer as Detailed on Structural Drawings: For use under roof installations with bar-joist construction to attach to bottom chord of joist.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Provide one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

L. Saddles and Shields: Unless otherwise indicated provide the followings:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Unless otherwise indicated provide the following:

1. Restraint-Control Devices (MSS Type 47): To control pipe movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

P. Provide powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where indicated in concrete construction.

END OF SECTION 220529

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, Aluminum, or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.

1. Material: 0.032-inch- thick brass or

2. Material: 0.0375-inch- thick stainless steel or

3. Material: 3/32-inch- thick laminated plastic with 2 black surfaces and white inner layer.

B. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

2.5 VALVE SCHEDULES

A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws and hangers.

2. Frame: Finished hardwood or extruded aluminum.

3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.6 VALVE PLAN

A. Valve Plan: Prepare a scale drawing. Provide the location and identity of each valve.

1. Valve Plan Frames: Glazed display frame for removable mounting on masonry walls for each page of valve plan. Include mounting screws and hangers.

2. Frame: Finished hardwood or extruded aluminum.

3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.7 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Cold Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

2. Domestic Hot Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3. Storm Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

   a. Domestic Cold Water: 1 ½", round.
   b. Domestic Hot Water: 1 ½", round.
   c. Domestic Hot Water Recirculation: 1 ½", round.
   d. Natural Gas: 2", round.

2. Valve-Tag Color:

   a. Domestic Cold Water: Blue.
   b. Domestic Hot Water: Red.
   c. Domestic Hot Water Recirculation: Red.
   d. Natural Gas: Yellow.

3. Letter Color:

   a. Domestic Cold Water: Black.
   b. Domestic Hot Water: White.

c. Domestic Hot Water Recirculation: White.
d. Natural Gas: 2", Black.

3.5 VALVE SCHEDULE INSTALLATION

A. Mount valve schedules on wall in accessible location in each major equipment room and where directed by owner.

3.6 VALVE PLAN INSTALLATION

A. Mount valve plans on wall in accessible location in each major equipment room and where directed by owner.

3.7 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.8 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.9 CLEANING

A. Clean faces of mechanical identification devices and glass fronts of valve schedules and plans.

END OF SECTION 220553

SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Outdoor pipe: Pipe located outside the building insulation envelope.

B. Plenum: An unoccupied space or void, on the conditioned side of the building insulation and vapor barrier, being used to return conditioned air to the inlet side of a return or exhaust fan either directly or via a duct connection. An example would be a space with air handling light fixtures or openings in the ceiling used to transport air through the ceiling and then to an open duct located above the ceiling in another location.

C. Indirectly Conditioned Space: A space having no direct conditioning but, due to air movement induced by an exhaust, or return opening, is conditioned by makeup air from an adjacent space. An example would be a small toilet. Boiler rooms, fan rooms, and mechanical rooms do not qualify as indirectly conditioned spaces.

D. Inside the Building Insulation Envelope: For the purposes of this section, boiler rooms, fan rooms, and mechanical rooms are considered to be OUTSIDE the building insulation envelope.

E. Exposed: Visible from any angle without removal of building element or equipment.

F. Concealed: Enclosed in building element or above ceiling such that it is not visible from any angle without removal of building element or equipment.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

B. Ship Insulated Piping System Components on pallets and wood supports. Securely fasten and protect from damage. Store off the ground and cover with opaque waterproof tarp to protect materials from sunlight and rain.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Adhesive: As recommended by insulation material manufacturer.
2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 (Pipe Insulation).
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Insulco, Division of MFS, Inc.; Triple I.
b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. P. K. Insulation Mfg. Co., Inc.; Thermal-V-Kote.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Insulco, Division of MFS, Inc.; SmoothKote.
b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-96.
b. Foster Products Corporation, H. B. Fuller Company; 81-33.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.
c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Red Devil, Inc.; Celulon Ultra Clear.
e. Speedline Corporation; Speedline Vinyl Adhesive.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-30.
b. Foster Products Corporation, H. B. Fuller Company; 30-35.
c. ITW TACC, Division of Illinois Tool Works; CB-25.
d. Marathon Industries, Inc.; 501.
e. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; Encacel.
b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
c. Marathon Industries, Inc.; 570.
d. Mon-Eco Industries, Inc.; 55-70.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-10.
b. Foster Products Corporation, H. B. Fuller Company; 35-00.
c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
d. Marathon Industries, Inc.; 550.
e. Mon-Eco Industries, Inc.; 55-50.
f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-52.
b. Foster Products Corporation, H. B. Fuller Company; 81-42.
c. Marathon Industries, Inc.; 130.
d. Mon-Eco Industries, Inc.; 11-30.
e. Vimasco Corporation; 136.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over equipment and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F.
4. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-76-8.
    b. Foster Products Corporation, H. B. Fuller Company; 95-44.
    c. Marathon Industries, Inc.; 405.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

5. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96 and

with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

6. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Compac Corp.; 104 and 105.
c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 4 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 4 inches.

3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
   b. Compac Corp.; 130.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
   d. Venture Tape; 1506 CW NS.

2. Width: 3 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   b. Compac Corp.; 120.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
   d. Venture Tape; 3520 CW.

2. Width: 3 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.

2. Width: 3 inches.
3. Film Thickness: 4 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products; Bands.
b. PABCO Metals Corporation; Bands.
c. RPR Products, Inc.; Bands.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.020 inch thick, 3/4 inch wide with wing seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; CWP-1.
2) GEMCO; CD.
3) Midwest Fasteners, Inc.; CD.
4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; CWP-1.
2) GEMCO; Cupped Head Weld Pin.
3) Midwest Fasteners, Inc.; Cupped Head.
4) Nelson Stud Welding; CHP.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.

2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
c. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
2) GEMCO; Press and Peel.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) GEMCO.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy, 0.062-inch soft-annealed, stainless steel or 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements,:

a. C & F Wire.
b. Childers Products.
c. PABCO Metals Corporation.
d. RPR Products, Inc.

2.10 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation,

install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Firestopping" and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Firestopping."

3.5 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Mineral Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

a. Do not weld anchor pins to ASME-labeled pressure vessels.
b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
d. Do not overcompress insulation during installation.
e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
f. Impale insulation over anchor pins and attach speed washers.
g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

C. Insulation Installation on Pumps:

1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch- diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
2. Fabricate boxes from galvanized steel, at least 0.050 inch thick.
3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3.6 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the

connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.7 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.10 FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Domestic water pump insulation shall be the following:
1. Mineral-Fiber Board: 1 inch thick and 2-lb/cu. ft. nominal density.

D. Domestic hot-water pump insulation shall be one of the following:

1. Mineral-Fiber Board: 1 inch thick and 2-lb/cu. ft. nominal density.

E. Domestic water and domestic hot-water hydropneumatic tank insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber Board: 1 inch thick and 2-lb/cu. ft. nominal density.

F. Domestic hot-water storage tank insulation shall be the following:

1. Mineral-Fiber Pipe and Tank: 4 inches thick.

3.13 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.14 INDOOR APPLICATION SCHEDULE (ABOVE SLAB):

A. Service: Domestic hot water.

1. Insulation Material: Mineral fiber preformed or flexible elastomeric pipe insulation.
2. Insulation Thickness: Apply the following insulation thicknesses:
   a. Copper Pipe, ½" through 1½" in diameter: 1"
   b. Copper Pipe, larger than 1½" in diameter: 1"
3. Vapor Retarder Required: No.
4. Finish: Exposed = Painted, concealed = none.

B. Service: Domestic recirculated hot water.

1. Insulation Material: Mineral fiber preformed or flexible elastomeric pipe insulation.
   a. Insulation Thickness:
      1) Copper pipe ½" & ¾" in diameter: ½"
      2) Copper pipe 1" and larger in diameter: 1"
2. Vapor Retarder Required: No.
3. Finish: Exposed = Painted, concealed = none.

C. Service: Domestic cold water.

1. Insulation Material: Mineral fiber preformed or flexible elastomeric pipe insulation.
2. Insulation Thickness: ½"
3. Vapor Retarder Required: Yes.
4. Finish: Exposed = Painted, concealed = none.

D. Service: Rainwater conductors (Includes secondary roof drain conductors).

1. Insulation Material: Mineral fiber preformed pipe insulation or Mineral-Fiber Blanket with Factory Applied FSK Jacket.

2. Insulation Thickness: 1”
3. Vapor Retarder Required: Yes.
4. Finish: Exposed = Painted, concealed = none.

E. Service: Roof drain and overflow drain bodies.

1. Insulation Material: Semi-Rigid Mineral-Fiber Board Thermal Insulation
2. Insulation Thickness: 1½”
3. Vapor Retarder Required: Yes.
4. Finish: Exposed = Painted, concealed = none.

F. Service: Exposed piping:
1. Mineral fiber preformed pipe insulation with Factory Applied FSK Jacket.
2. Insulation Thickness: 1”
3. Vapor Retarder Required: Yes.
4. Finish: Exposed = Painted, concealed = none.

G. Service: Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Drainage from any Equipment. Measurement shall be pipe length.
1. Insulation Material: Mineral fiber preformed pipe insulation with Factory Applied FSK Jacket.
2. Insulation Thickness: 1”
3. Vapor Retarder Required: Yes.
4. Finish: Exposed = Painted, concealed = none.

H. Service: Condensate Drains, & Traps.
1. Insulation Material: Mineral fiber preformed pipe insulation with Factory Applied FSK Jacket.
2. Insulation Thickness: 1”
3. Vapor Retarder Required: Yes.
4. Finish: Exposed = Painted, concealed = none.

I. Service: Equipment Non-condensate Drains, & Traps.
1. Insulation Material: Mineral fiber preformed pipe insulation with Factory Applied FSK Jacket.
2. Insulation Thickness: 1”
3. Vapor Retarder Required: Yes.
4. Finish: Exposed = Painted, concealed = none.

3.15 INDOOR APPLICATION SCHEDULE (BELOW SLAB):

1. None required.

END OF SECTION 220700

SECTION 221113 – FACILITY NATURAL-GAS PIPING

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.
3. Service Meter: 65 psig minimum unless otherwise indicated.

B. Gas System Pressures: Primary pressure from the utility is more than 2.0 psig, and is reduced to a secondary pressure of 2.0 psig by a pressure reducing valve installed immediately downstream of the meter, and is reduced again by pressure reducing valves located at each piece of equipment.

1.4 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Pipe and fittings.
3. Corrugated, stainless-steel tubing with associated components.
4. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
5. Pressure regulators. Indicate pressure ratings and capacities.
6. Service meters. Indicate pressure ratings and capacities. Include bypass fittings bypass fittings and meter bars meter bars.
7. Dielectric fittings.

B. Operation and Maintenance Data: For motorized gas valves, pressure regulators, and service meters to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components and Devices: If indicated, provide electrical components and devices that are listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Applicable Codes: Comply with the 2021 South Carolina Fuel Gas Code.

C. Fuel Gas Piping: Listed and labeled as required by the 2021 South Carolina Fuel Gas Code.

D. UL Standard: Provide components listed in UL's "Gas and Oil Equipment Directory" where UL listing is indicated.

E. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

F. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.7 PROJECT CONDITIONS

A. Perform site survey: Contract with utility-locating service for area where Project is located, and locate utilities.

B. Design values of fuel gas supplied for these systems are as follows:

1. Nominal Heating Value: 1000 Btu/cu.ft.
2. Nominal Specific Gravity: 0.60

C. Interruption of Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after

arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Architect and Owner no fewer than two days in advance of proposed interruption of natural-gas service.
2. Do not proceed with interruption of natural-gas service without Architect and Owner's written permission.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Cold press mechanical joint fittings: ASTM A420 or ASME B16.3. (*AD-05)
   a. Sealing elements: Hydrogenated Nitrile Butadiene Rubber (HNBR)
4. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
5. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
   a. Material Group: 1.1.
   b. End Connections: Threaded or butt welding to match pipe.
   c. Lapped Face: Not permitted underground.
   d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
   e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
6. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
   a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

2.3 POLYETHLENE PIPE, FITTINGS, AND JOINING MATERIALS

A. Available Manufacturers:

1. ERS Inc.
2. Titeflex Corp.

B. Polyethlene Pipe: Pipe shall be produced for use in gas distribution systems in accordance with the latest published edition of ASTM D 2513 Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

C. Polyethlene Fittings: Fittings shall be produced for use in gas distribution systems in accordance with the latest published edition of ASTM D 2513 Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

D. Joining Materials: Joining materials shall be as recommended by the pipe and fitting manufacturer for service intended.

2.4 PROTECTIVE COATING

A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in corrosive atmosphere.

2.5 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.6 VALVES

A. Refer to section “General Duty Valves for Plumbing Piping”.

2.7 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72”

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for 2" and smaller; flanged ends for 2 ½" and larger.
3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.8 SPECIALTY VALVES

A. Available Manufacturers:

1. ASCO General Controls.
2. Automatic Switch Co.
3. Eaton Corp.; Controls Div.
4. Honeywell, Inc.
5. Johnson Controls, Inc.

B. Automatic Gas Valves: ANSI Z21.21, with electrical or mechanical operator for actuation by appliance automatic shutoff device.

2.9 Valves, 2" and Smaller: Ball valves with threaded ends according to ASME B1.20.1 for pipe threads.

2.10 Valves, 2-1/2" and Larger: Butterfly valves for use with flanged ends according to ASME B16.5 for steel flanges.

2.11 PRESSURE REGULATORS

A. Available Manufacturers:

1. Line Pressure Regulators:
   a. American Meter Co.
   b. Donkin: Bryan Donkin RMG Canada, Ltd.
   c. Eclipse Combustion, Inc.
   d. Equimeter, Inc.
   e. Fisher Controls International, Inc.
   f. Maxitrol Co.
   g. National Meter.
   h. Richards Industries, Inc.; Jordan Valve Div.
   i. Schlumberger Industries; Gas Div.

B. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.

1. 2" and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
2. 2 ½" and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
3. Line Pressure Regulators: ANSI Z21.80 with 5-psig minimum inlet pressure rating.
4. Appliance Pressure Regulators: ANSI Z21.18 with 2-psig minimum inlet pressure. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction. If vents are required provided piping necessary to extend to termination location outside the building as approved by the architect.

C. Pressure Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening if not connected to vent piping. Extend to exterior of building and terminate in location approved by the architect.

D. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Available Manufacturers:
   a. Canadian Meter Company Inc.
   b. Eaton Corporation; Controls Div.
   c. Harper Wyman Co.
   d. Maxitrol Company.
   e. SCP, Inc.
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 psig.

2.12 CONCRETE BASES

A. Description: Reinforced concrete base formed of 3000-psi- minimum, 28-day compressive strength concrete, and measuring 6 inches thick and 6 inches larger in each dimension than equipment, unless otherwise indicated.

2.13 DIELECTRIC FITTINGS

A. Dielectric Unions:

1. Available Manufacturers:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Hart Industries International, Inc.
   d. McDonald, A. Y. Mfg. Co.
   e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.

f. Wilkins; Zurn Plumbing Products Group.
2. Minimum Operating-Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

B. Dielectric Flanges:

1. Available Manufacturers:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
   d. Wilkins; Zurn Plumbing Products Group.
2. Minimum Operating-Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

C. Dielectric-Flange Kits:

1. Available Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.
2. Minimum Operating-Pressure Rating: 150 psig.
3. Companion-flange assembly for field assembly.
4. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.
5. Insulating materials suitable for natural gas.
6. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.14 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches 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 yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Inspect natural-gas piping according to the 2021 Virginia Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

B. Comply with the 2021 Virginia Fuel Gas Code requirements for prevention of accidental ignition.

3.3 SERVICE ENTRANCE PIPING

A. Extend fuel gas piping and connect to fuel gas distribution piping downstream of meter.

1. Service meter will be provided by Local Gas Utility.

B. Install dielectric fitting downstream from and adjacent to each service meter unless meter is supported from service-meter bar with integral dielectric fitting. Install shutoff valve downstream from and adjacent to dielectric fitting. Refer to Division 22 Section "Common Work Results for Plumbing" for dielectric fittings.

3.4 CONCRETE BASE INSTALLATION

A. Locate bases at service meters and service regulators.

B. Excavate earth and make level beds to support bases. Form and pour concrete bases level with top surface projecting approximately 3 inches above grade.

3.5 OUTDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Steel Piping Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.

2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

E. Copper Tubing Protective Coating:

1. Apply joint cover kits over tubing to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.Install fittings for changes in direction and branch connections.

F. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Section "Meters and Gages for Plumbing Piping."

3.6 INDOOR PIPING INSTALLATION

A. Comply with the 2021 Virginia Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to are accepted by architect.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms.

E. Install piping indicated to be exposed and piping in equipment rooms at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 incheslong and

same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install pre-sleeved corrugated, stainless-steel tubing systems for natural-gas. Cover with minimum of 1-1/2 inches of concrete. Jacket may not be in physical contact with metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives.
3. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
    a. Exception: Tubing passing through partitions or walls does not require striker barriers.
4. Prohibited Locations:
    a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install natural-gas piping in solid walls or partitions.

Q. Connect branch piping from top or side of horizontal piping.

R. Install unions in pipes 2” and smaller, adjacent to each valve, at final connection to each piece of equipment and where otherwise indicated. Unions are not required at flanged connections.

S. Do not use natural-gas piping as grounding electrode.

T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

U. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Section "Meters and Gages for Plumbing Piping."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section "Sleeves and Sleeve Seals for HVAC Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

Y. Install corrugated, stainless-steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

Z. Install containment casings for gas piping below slabs extending minimum of 2 inches beyond point where pipe emerges from the floor. Tightly seal ends around gas piping using mechanical sleeve seals.

3.7 SERVICE-METER ASSEMBLY INSTALLATION

A. Provide concrete base for service meter.

B. Install locking shutoff valves downstream from service regulator. Shutoff valves are not required at second regulator if two regulators are installed in series.

C. Install strainer on inlet of service-pressure regulator.

D. Install service pressure regulator mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.

E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.

3.8 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.9 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Cold Press Joints:

1. Pipe and fittings shall comply with ANSI LC-4/CSA 6.32 and the latest edition of NFPA-54.
2. Fittings shall comply with requirements of ASTM F3226.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not over-tighten.

H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.10 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. 1” and Smaller: Maximum span, 96”; minimum rod size, 3/8”.
2. 1¼”: Maximum span, 108”; minimum rod size, 3/8”.
3. 1½” and 2”: Maximum span, 108”; minimum rod size, 3/8”.
4. 2½” to 3 ½”: Maximum span, 10’-0”; minimum rod size, ½”.
5. 4” and Larger: Maximum span, 10’-0”; minimum rod size, 5/8”.

3.11 CONNECTIONS

A. Connect to utility's gas meter according to utility's procedures and requirements.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.

C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72” of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.12 PIPING APPLICATIONS

A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

B. Above Ground Exposed Fuel Gas Piping:

1. Sizes up to 2”:
   a. Steel pipe, malleable-iron threaded fittings, and threaded joints.
   b. Steel pipe, cold press fittings.
2. 2½” to 4”: Steel pipe, malleable-iron threaded fittings, and threaded joints, or steel pipe, steel welding fittings, and welded joints.
3. Larger Than NPS 4: Steel pipe, steel welding fittings, and welded joints.

C. Above Ground Concealed Fuel Gas Piping:

1. Sizes up to 2”:
   a. Steel pipe, malleable-iron threaded fittings, and threaded joints.
   b. Steel pipe, cold press fittings.
2. 2½” to 4”: Steel pipe, malleable-iron threaded fittings, and threaded joints, or steel pipe, steel welding fittings, and welded joints.
3. Larger Than NPS 4: Steel pipe, steel welding fittings, and welded joints.

D. Exterior Underground Fuel Gas Piping:

1. All Sizes: Polyethylene pipe, fittings and joining materials.

E. Under Slab Fuel Gas Piping: (NOTICE: Method of fuel gas piping installation below floor slab must be approved by the local code authority.)

1. Pre-Sleeved Corrugated, Stainless-Steel Tubing Systems.
2. Steel pipe, steel welding fittings, and welded joints with welded steel vented conduit.

3.13 LABELING AND IDENTIFYING

A. Comply with requirements in Section "Identification for Plumbing Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12” minimum below finished grade.

1. Exception: 6 minimum below sub-grade under pavements and slabs.

3.14 PAINTING

A. Use materials and procedures in Division 9 Section "Painting," "Exterior Paint Schedule" Article, "Ferrous Metal" Paragraph, "Full-Gloss, Alkyd-Enamel Finish" Subparagraph.

B. Paint exterior service meters, pressure regulators, specialty valves, and piping.

1. Color: Gray.

3.15 FIELD QUALITY CONTROL

A. Inspect, test, and purge piping according to ANSI Z223.1, Part 4 "Inspection, Testing, and Purging," and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Report test results promptly and in writing to Architect and authorities having jurisdiction.

D. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

E. Verify correct pressure settings for pressure regulators.

F. Verify that specified piping tests are complete.

3.16 ADJUSTING

A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION 221113

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
   1. Domestic Water Service Piping: 160 psig.
   2. Domestic Water Distribution Piping: 125 psig.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Remaining paragraphs are defined in Division 01 Section "Submittal Procedures" as "Informational Submittals."

C. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

   1. Fire-suppression-water piping.
   2. Domestic water piping.
   3. Sanitary waste piping
   4. HVAC hydronic piping.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
5. Copper Pressure-Seal-Joint Fittings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Elkhart Products Corporation; Industrial Division.
        2) Nibco Inc.
        3) Viega; Plumbing and Heating Systems.
        4) Victaulic Company.

    b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
    c. NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

6. Grooved-Joint Copper-Tube Appurtenances:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Anvil International.
        2) Shurjoint Piping Products.
        3) Victaulic Company.

    b. Copper Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
    c. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, EPDM-rubber gaskets suitable for hot and cold water, and bolts and nuts.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2. Copper Pressure-Seal-Joint Fittings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Elkhart Products Corporation; Industrial Division.
        2) NIBCO INC.
        3) Viega; Plumbing and Heating Systems.

    b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
    c. NPS 3 and NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Standard-Pattern, Mechanical-Joint Fittings: AWWA C110, ductile or gray iron.
2. Compact-Pattern, Mechanical-Joint Fittings: AWWA C153, ductile iron.

    a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Standard-Pattern, Push-on-Joint Fittings: AWWA C110, ductile or gray iron.

    a. Gaskets: AWWA C111, rubber.

2. Compact-Pattern, Push-on-Joint Fittings: AWWA C153, ductile iron.

    a. Gaskets: AWWA C111, rubber.

C. Plain-End, Ductile-Iron Pipe: AWWA C151.

1. Grooved-Joint, Ductile-Iron-Pipe Appurtenances:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Anvil International.
        2) Shurjoint Piping Products.
        3) Star Pipe Products.
        4) Victaulic Company.

    b. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.

c. Grooved-End, Ductile-Iron-Pipe Couplings: AWWA C606 for ductile-iron-pipe dimensions. Include ferrous housing sections, EPDM-rubber gaskets suitable for hot and cold water, and bolts and nuts.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Dresser Piping Specialties.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc; a Sensus company.
g. Viking Johnson; c/o Mueller Co.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Hart Industries International, Inc.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   f. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

   a. Pressure Rating: 150 psig at 180 deg F.
   b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. EPCO Sales, Inc.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Factory-fabricated, bolted, companion-flange assembly.
   b. Pressure Rating: 150 psig.
   c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.

2. Description:

   a. Nonconducting materials for field assembly of companion flanges.
   b. Pressure Rating: 150 psig.
   c. Gasket: Neoprene or phenolic.
   d. Bolt Sleeves: Phenolic or polyethylene.
   e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Calpico, Inc.
   b. Lochinvar Corporation.

2. Description:

   a. Galvanized-steel coupling.
   b. Pressure Rating: 300 psig at 225 deg F.
   c. End Connections: Female threaded.
   d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Perfection Corporation; a subsidiary of American Meter Company.
   b. Precision Plumbing Products, Inc.
   c. Victaulic Company.

2. Description:

   a. Electroplated steel nipple complying with ASTM F 1545.
   b. Pressure Rating: 300 psig at 225 deg F.
   c. End Connections: Male threaded or grooved.
   d. Lining: Inert and noncorrosive, propylene.

2.7 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Flex Pression, Ltd.
4. Flex-Weld, Inc.
5. Hyspan Precision Products, Inc.
6. Mercer Rubber Co.
7. Metraflex, Inc.
8. Proco Products, Inc.
9. Tozen Corporation.
10. Unaflex, Inc.
11. Universal Metal Hose; a Hyspan company

B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 250 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 250 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

2.8 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew.

E. Split Casting, Cast Brass: Polished, chrome-plated finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with exposed-rivet hinge, setscrew.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.9 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.10 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.11 WALL PENETRATION SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. SIGMA.

B. Description: Wall-sleeve assembly, consisting of housing and gland, gaskets, and pipe sleeve.

1. Carrier-Pipe Deflection: Up to 5 percent without leakage.
2. Housing: Ductile-iron casting with hub, waterstop, anchor ring, and locking devices. Include gland, bolts, and nuts.
3. Housing-to-Sleeve Gasket: EPDM rubber.
4. Housing-to-Carrier-Pipe Gasket: AWWA C111, EPDM rubber.
5. Pipe Sleeve: AWWA C151, ductile-iron pipe.

2.12 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure-reducing valves.

H. Install domestic water piping level without pitch and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping adjacent to equipment and specialties to allow service and maintenance.

N. Install piping to permit valve servicing.

O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

P. Install piping free of sags and bends.

Q. Install fittings for changes in direction and branch connections.

R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

S. Install pressure gages on suction and discharge piping from each plumbing pump and packaged booster pump. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

T. Install thermostats in hot-water circulation piping. Comply with requirements in Division 22 Section "Domestic Water Pumps" for thermostats.

U. Install thermometers on outlet piping from each water heater. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Copper-Tubing Grooved Joints: Roll groove end of tube. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for roll-grooved joints.

H. Ductile-Iron-Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints.

I. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

D. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for calibrated balancing valves.

3.5 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.
2. NPS 2 and Larger: Sleeve-type coupling.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.7 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump and in suction and discharge manifold connections to each domestic water booster pump.

B. Install bronze-hose flexible connectors in copper domestic water tubing.

C. Install stainless-steel-hose flexible connectors in steel domestic water piping.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.

G. Install supports for vertical steel piping every 15 feet.

H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.10 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish.
5. Bare Piping in Equipment Rooms: One piece, stamped steel with set screw or spring clips.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

C. Escutcheons for Existing Piping:

1. Chrome-Plated Piping: Split casting, cast brass with chrome-plated finish.
2. Insulated Piping: Split plate, stamped steel with concealed hinge and spring clips.

3. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split casting, cast brass with chrome-plated finish.
4. Bare Piping at Ceiling Penetrations in Finished Spaces: Split casting, cast brass with chrome-plated finish.
5. Bare Piping in Unfinished Service Spaces: Split casting, cast brass with polished chrome-plated finish.
6. Bare Piping in Equipment Rooms: Split plate, stamped steel with set screw or spring clips.
7. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting floor plate.

3.11 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.

    a. Extend sleeves 2 inches above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to

extend sleeve to 2 inches above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

   a. Steel pipe sleeves for pipes smaller than NPS 6.
   b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.
   c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Exterior Concrete Walls:

   a. Steel pipe sleeves for pipes smaller than NPS 6.
   b. Cast-iron wall pipe sleeves for pipes NPS 6 and larger.
   c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
   d. Do not use sleeves when wall penetration systems are used.

5. Sleeves for Piping Passing through Interior Concrete Walls:

   a. Steel pipe sleeves for pipes smaller than NPS 6.
   b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestop materials and installations.

3.12 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.13 WALL PENETRATION SYSTEM INSTALLATION

A. Install wall penetration systems in new, exterior concrete walls.

B. Assemble wall penetration system components with sleeve pipe. Install so that end of sleeve pipe and face of housing are flush with wall. Adjust locking devices to secure sleeve pipe in housing.

3.14 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.15 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.16 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.17 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.18 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water, building service piping, NPS 3 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings; and brazed joints.

D. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings; and brazed joints.
2. Mechanical-joint, ductile-iron pipe; standard- or compact- pattern mechanical-joint fittings; and mechanical joints.

E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

F. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; wrought- copper solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

G. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; wrought- copper solder-joint fittings; and brazed joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L; grooved-joint copper-tube appurtenances; and grooved joints.

3.19 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Provide ball valves for piping NPS 2 and smaller. Provide butterfly, or ball valves with flanged ends for piping NPS 2-1/2 and larger.

2. Throttling Duty: Provide ball valves for piping NPS 2 and smaller. Provide butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Provide automatic flow control valves.
4. Drain Duty: Provide Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

0.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum two years documented experience.

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ames Co.
   b. Cash Acme.
   c. Conbraco Industries, Inc.
   d. FEBCO; SPX Valves & Controls.
   e. Rain Bird Corporation.
   f. Toro Company (The); Irrigation Div.
   g. Watts Industries, Inc.; Water Products Div.
   h. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Arrowhead Brass Products, Inc.
   b. Cash Acme.
   c. Conbraco Industries, Inc.
   d. Legend Valve.
   e. MIFAB, Inc.
   f. Prier Products, Inc.
   g. Watts Industries, Inc.; Water Products Div.
   h. Woodford Manufacturing Company.
   i. Zurn Plumbing Products Group; Light Commercial Operation.
   j. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

C. Spill-Resistant Vacuum Breakers: (VB-1 thru VB-4)

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.
b. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1056.
3. Operation: Continuous-pressure applications.
4. Size: NPS 1/2.
5. Accessories:

a. Valves: Ball type, on inlet and outlet.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. Retain one of first three subparagraphs and list of manufacturers below. See Division 01 Section "Product Requirements."

1. Basis-of-Design Product: Provide the product indicated on the Drawing Schedule or a comparable product by one of the following:

a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 15 psig Insert pressure maximum, through middle 1/3 of flow range.
5. Pressure Loss at Design Flow Rate: 14psig for sizes NPS 2 and smaller; 15psig for NPS 2-1/2 and larger.
6. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
8. Configuration: Designed for horizontal, straight through flow.
9. Accessories:

a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Reduced-Pressure-Detector, Fire-Protection Backflow-Preventer Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.

d. Watts Industries, Inc.; Water Products Div.
e. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1047 and FMG approved or UL listed.
3. Operation: Continuous-pressure applications.
4. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved.
5. End Connections: Flanged.
6. Configuration: Designed for horizontal, straight through flow.
7. Accessories:

a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet.
b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
c. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

C. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.
b. Watts Industries, Inc.; Water Products Div.
c. Woodford Manufacturing Company.

2. Standard: ASSE 1052.
3. Operation: Up to 10-foot head of water back pressure.
4. Inlet Size: NPS 1/2 or NPS 3/4.
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least 3-gpm flow.

D. Backflow-Preventer Test Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.
b. FEBCO; SPX Valves & Controls.
c. Flomatic Corporation.
d. Watts Industries, Inc.; Water Products Div.
e. Zurn Plumbing Products Group; Wilkins Div.

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.3 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armstrong International, Inc.
    b. Flo Fab Inc.
    c. ITT Industries; Bell & Gossett Div.
    d. NIBCO INC.
    e. TAC Americas.
    f. Taco, Inc.
    g. Watts Industries, Inc.; Water Products Div.

2. Type: Ball valve with two readout ports and memory setting indicator.
3. Body: bronze,
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

C. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Conbraco Industries, Inc.
    b. Crane Co.; Crane Valve Group; Crane Valves.
    c. Crane Co.; Crane Valve Group; Jenkins Valves.
    d. Crane Co.; Crane Valve Group; Stockham Div.
    e. Hammond Valve.
    f. Milwaukee Valve Company.
    g. NIBCO INC.
    h. Red-White Valve Corp.

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

D. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cash Acme.
    b. Conbraco Industries, Inc.
    c. Honeywell Water Controls.
    d. Lawler Manufacturing Company, Inc.

e. Leonard Valve Company.
f. Powers; a Watts Industries Co.
g. Watts Industries, Inc.; Water Products Div.
h. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1016, thermostatically controlled water tempering valve.
3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 105 deg F.
9. Tempered-Water Design Flow Rate: 2 gpm.

2.4 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller;flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

   a. StrainersNPS 2 and Smaller: 0.033 inch.
   b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
   c. Strainers NPS 5 and Larger: 0.10 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.5 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.6 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Manufacturers: Sizes on drawings based on Jay R Smith HYDROTROL models, fixture units, and PDI symbols A-F. Subject to compliance with requirements, provide products by one of the following:

    a. AMTROL, Inc.
    b. Josam Company.
    c. PPP Inc.
    d. Sioux Chief Manufacturing Company, Inc.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Tyler Pipe; Wade Div.
    g. Watts Drainage Products Inc.
    h. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.7 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.8 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. PPP Inc.

b. Sioux Chief Manufacturing Company, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.9 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems: (TPV-1)

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. PPP Inc.

2. Standard: ASSE 1044,
3. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
4. Cabinet: Surface-mounting steel box with stainless-steel cover.
5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
6. Vacuum Breaker: ASSE 1001.
7. Number Outlets: Five.
8. Size Outlets: NPS 1/2.

2.10 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Thermostatic Water Mixing Valves:

1. Refer to drawing schedule for manufacturer, model numbers and operating requirements.
2. Available Manufacturers:

a. Lawler Manufacturing Company, Inc.
b. Leonard Valve Company.
c. Powers; a Watts Industries Co.
d. Symmons Industries, Inc.
e. Acorn Controls.
f. Armstrong International

3. Standard: ASSE 1017.

4. Pressure Rating: 125 psig.

5. Material: Bronze body with corrosion-resistant interior components.

6. Connections: union inlets and outlet.

7. Accessories:
    a. Check stops on hot- and cold-water supplies.
    b. Handle.
    c. Dial thermometer on inlets and outlet.
    d. Pressure gauges on inlets and outlet.
8. Pressure Rating: 125 psig, unless otherwise indicated.

B. Individual-Fixture, Water Tempering Valves:

1. Refer to drawing schedule for manufacturer and operating requirements.
2. Available Manufacturers:
    a. Apollo Valves - Conbraco Industries, Inc.
    b. Lawler Manufacturing Company, Inc.
    c. Leonard Valve Company.
    d. Acorn Controls.
    e. Powers; a Watts Industries Co.
    f. Watts Industries, Inc.; Water Products Div.
    g. Zurn Plumbing Products Group; Wilkins Div.
3. Standard: ASSE 1016, thermostatically controlled water tempering valve.
4. Pressure Rating: 125 psig minimum, unless otherwise indicated.
5. Body: Bronze body with corrosion-resistant interior components.
6. Temperature Control: Adjustable.
7. Inlets and Outlet: Threaded. Provide unions and valves.
8. Finish: Chrome-plated bronze.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.

3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

D. Install water control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

E. Install balancing valves in locations where they can easily be adjusted.

F. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified.

G. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve and solenoid valve,.

H. Install outlet boxes recessed in wall. Install 2-by-4-inch fire-retardant-treated-wood blocking wall reinforcement between studs. Fire-retardant-treated-wood blocking is specified in Division 06 Section "Rough Carpentry."

I. Install water hammer arresters in water piping according to PDI-WH 201.

J. Install air vents at high points of water piping. Install drain piping and discharge onto floor drain.

K. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

L. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Intermediate atmospheric-vent backflow preventers.
3. Reduced-pressure-principle backflow preventers.
4. Reduced-pressure-detector, fire-protection backflow-preventer assemblies.
5. Double-check, detector-assembly backflow preventers.
6. Water pressure-reducing valves.
7. Calibrated balancing valves.
8. Primary water tempering valves.
9. Outlet boxes.
10. Supply-type, trap-seal primer valves.
11. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each pressure vacuum breaker reduced-pressure-principle backflow preventer double-check backflow-prevention assembly and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119

SECTION 221123 - PACKAGED BOOSTER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Withstand: Units shall remain in place without separation of any parts when subjected to seismic forces indicated. “Essential facility” units shall be fully operational after the seismic event.

1.3 ABBREVIATIONS

A. BAS Building Automation System

B. VFD Variable Frequency Drive

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Booster pumps shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, and dimensions of individual components. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Provide wiring diagrams for power, signal, and control wiring. Indicate interface with BAS.

C. Operation and Maintenance Data: For booster pumps to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Comply with ASME B31.9 for piping.

C. UL Compliance for Packaged Pumping Systems:

1. UL 508, "Industrial Control Equipment."
2. UL 508A, "Industrial Control Panels."
3. UL 778, "Motor-Operated Water Pumps."
4. UL 1995, "Heating and Cooling Equipment."

D. Booster pumps shall be listed and labeled as packaged pumping systems by testing agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Retain or apply protective coatings and flange protective covers during storage.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 MULTIPLEX, VARIABLE-SPEED BOOSTER PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong Pumps Inc.
2. Bell & Gossett
3. Canariis Corporation
4. Goulds Pumps
5. Grundfos Pumps Corporation U.S.A.
6. Patterson Pump Company
7. QuantumFlo
8. SyncroFlo, Inc.
9. Taco, Inc.
10. TigerFlow Systems, Inc.

B. Description: Base mounted, factory-assembled and -tested, fluid-handling system for domestic water, with pumps, piping, valves, specialties, and controls.

C. Pumps:

1. Type: Contractors' option / manufacturer's lowest cost all brass or bronze centrifugal pump.
2. Impeller: Closed, ASTM B 584 cast bronze; statically and dynamically balanced and keyed to shaft.
3. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve and deflector.

4. Seal: Mechanical.
5. Orientation: Mounted horizontally or vertically.

D. Motors: Single speed, with grease-lubricated or pre-greased, permanently shielded, ball-type bearings. Select motors that will not overload through full range of pump performance curve.

E. Piping: Copper

F. Valves:

1. Shutoff Valves NPS 2 and Smaller: Two-piece, full-port ball valve, in each pump's suction and discharge piping and in inlet and outlet headers.
2. Shutoff Valves NPS 2-1/2 and Larger: Lug-type butterfly valve, in each pump's suction and discharge piping and in inlet and outlet headers.
3. Check Valves: Silent type in each pump's discharge piping.
4. Thermal-Relief Valve: Temperature-and-pressure relief in pump discharge header.

G. Control Panel:

1. Factory installed and connected as an integral part of the booster pump.
2. Automatic control of multiple-pump ststem.
3. Variable-speed operation, with load control and protection functions.
4. Controls: Solid-state system with transducers, programmable microprocessor, VFD, and other devices in controller.
5. Motor Controller: NEMA ICS 2, variable-frequency, solid-state type.
6. Motor Overload Protection: Overload relay in each phase.
7. Starting Devices: Hand-off-automatic selector switch for each pump in cover of control panel, plus pilot device for automatic control.
    a. Sequence (Lead-Lag) Starter: Switches lead pump to lag pump and provides for multiple pump operation.
8. Pump Operation and Sequencing: Pressure-sensing method for lead pump and flow-sensing method for lag pumps.
    a. Time Delay: Controls pump on-off operation; adjustable from 1 to 300 seconds.
9. VFD: Voltage-source, pulse-width, modulating-frequency converter for each pump.
10. Manual Bypass: Magnetic contactor arranged to transfer to constant-speed operation upon VFD failure.
11. Instrumentation: Suction and discharge pressure gages.
12. Lights: Running light for each pump.
13. Alarm Signal Device: Sounds alarm when backup pumps are operating.
    a. Time Delay: Controls alarm operation; adjustable from 1 to 300 seconds, with automatic or no reset.
14. Thermal-bleed cutoff.
15. BAS Interface: Provide auxiliary contacts for interface to BAS. Include the following:
    a. On-off status of each pump.
    b. Alarm status of entire unit.

H. Base: Structural steel.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in NFPA 70.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for booster pumps to verify actual locations of piping connections before booster-pump installation.

3.2 INSTALLATION

A. Equipment Mounting: Install booster pumps on concrete housekeeping pad using spring isolators.
1. Minimum Deflection: 1 inch.
2. Install dowel rods to connect housekeeping pad to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete housekeeping pad.
3. Install epoxy-coated anchor bolts that extend through the housekeeping pad and anchor into structural concrete floor.

B. Support connected domestic-water piping so weight of piping is not supported by booster pumps.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.
1. Connect domestic-water piping to booster pump headers.
2. Install shutoff valves on piping connections to booster-pump suction and discharge headers. Install ball, or butterfly, valves.
3. Install, flanged, or grooved-joint connections on suction and discharge headers.
4. Install valved bypass, same size as water supply.
5. Install flexible connectors, same size as header, on connections to booster-pump suction and discharge headers.
6. Install piping adjacent to booster pumps to allow service and maintenance.

3.4 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Perform visual inspection.
2. Leak Test: After installation, charge booster pump and check for leaks. Repair leaks and recheck until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start booster pumps to confirm proper motor rotation and booster pump operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Prepare inspection reports.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING

A. Adjust booster pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust pressure set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting booster pump to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain booster pumps.

END OF SECTION 221123

SECTION 221125 - CIRCULATING PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.3 ABBREVIATIONS

A. BAS Building Automation System

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect against damage.

C. Comply with pump manufacturer's written instructions for handling.

PART 2 - PRODUCTS

2.1 CIRCULATING PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Corporation.
3. Grundfos Pumps Corp.

B. Description: Factory-assembled and -tested, in-line, wet rotor or system lubricated, close-coupled, 100% lead free, overhung-impeller, designed for circulating domestic hot water.

C. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Motor: Non-overloading at all points on the pump curve
3. Casing: Bronze, with companion-flange connections.
4. Impeller: Plastic.
5. Motor: Single speed, unless otherwise indicated.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 22 Section "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

2.3 CONTROLS

A. BAS: Electric, adjustable for control of water-supply pump.

1. Type: Start/Stop
2. Operation of Pump: Refer to Section “Sequence of Operation”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

B. Verify installation and location of automatic flow control valve(s). Record actual location(s) on as-built drawings.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install in-line, centrifugal pumps with shaft horizontal unless otherwise indicated.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

C. Connect domestic water piping to pumps.

D. Install suction and discharge piping.

E. Install indicated valves &devices.

F. Comply with Division 26 Sections for electrical connections.

G. Connect controls.

H. Interlock pump with water heater to deactivate water heater when pump is deactivated.

3.4 IDENTIFICATION

A. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.5 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Check operation of controls for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:

a. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
b. Verify that pump is rotating in the correct direction.

6. Prime pump.
7. Close discharge valve.
8. Start motor.
9. Open discharge valve slowly.
10. Adjust temperature settings on thermostatic mixing valves if included in design.
11. Adjust balancing valves if required by thermostatic mixing valve manufacturer.
12. Check and record pressure on inlet and outlet of pump.

END OF SECTION 221125

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. LLDPE: Linear, low-density polyethylene plastic.

C. NBR: Acrylonitrile-butadiene rubber.

D. PE: Polyethylene plastic.

E. PVC: Polyvinyl chloride plastic.

F. TPE: Thermoplastic elastomer.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding a minimum working pressure of 10-foot head of water.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other marking of testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. All cast iron soil pipe and fittings shall be marked with the Collective Trademark of the Cast Iron Soil Pipe Institute.

B. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy class(es).

C. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. All cast iron soil pipe and fittings shall be marked with the Collective Trademark of the Cast Iron Soil Pipe Institute.

B. Pipe and Fittings: ASTM A 888 or CISPI 301.

C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) ANACO-Husky.
2) Clamp-All Corp.
3) Mission Rubber Co.

2.4 STEEL PIPE AND FITTINGS

A. Pressure-Seal-Joint-End, ASTM A312, Type 304/304L, Schedule 5S Stainless Steel Pipe: NPS 2 and smaller; full finished annealed pipe, certified for use with press couplings and fittings.

1. Pressure-Seal-Joint Piping Systems:

a. Manufacturers:
1) Victaulic Co. of America.
2) Viega; Plumbing and Heating Systems

b. Pressure-Seal-Joint-End Fittings: UL-listed, ASTM A 403, WPW, WPW/S9, or CR/S9, or shall be fabricated from cold drawn stainless steel type A304/304L, with EPDM-rubber O-ring seal in each end.

B. Grooved-End, ASTM A312, Type 304/304L or 316/316L, Schedule 10 Stainless Steel Pipe: Schedule 10 in NPS 2 1/2 and larger; with factory- or field-formed, roll-grooved ends.

1. Grooved-Joint Piping Systems:

a. Manufacturers:
1) Victaulic Co. of America.
2) Ward Manufacturing.

b. Grooved-End Fittings: UL-listed, ASTM A 403, WPW, WPW/S9, or CR/S9, or shall be fabricated from stainless steel pipe conforming to ASTM A312, with

factory grooved ends. Fittings shall be type 304/304L or 316/316L stainless steel casting with OD matching steel-pipe OD.

c. Grooved-End-Pipe Couplings: UL-Listed, ASTM A 351, A 743 and A 744, rigid pattern, unless otherwise indicated; gasketed fitting matching stainless steel-pipe OD. Include stainless steel housing with keys matching stainless steel-pipe and fitting grooves, pressure responsive synthetic gasket , ASTM D 2000 listed for use with housing, and stainless steel bolts and nuts.

2.5 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

2.6 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

B. Solvent Cement and Adhesive Primer:

1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping shall be the following:
1. Hubless cast iron soil piping with heavy-duty couplings
2. Kitchen equipment waste: copper dwv pipe and fittings.

C. Underground, Soil, Waste, and Vent Piping:Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
2. Kitchen Waste: Extra Heavy Hub and Spigot cast-iron soil piping.
3. Other than kitchen waste: PVC pipe and fittings.

3.3 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

F. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

G. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Building Vacuum Waste Piping: 2 percent downward in direction of flow.
3. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow for piping NPS 2-1/2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
4. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

H. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

I. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

E. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.

3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

H. Install supports for vertical copper tubing every 10 feet.

I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 48 inches with 7/8-inch rod.

J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 ABBREVIATIONS

A. RPZ Reduced Pressure Zone

B. FOG Fats, oils, and greases.

1.3 DEFINITIONS

A. Withstand: Units shall remain in place without separation of any parts when subjected to seismic forces indicated. “Essential facility” units shall be fully operational after the seismic event.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Grease interceptors.
2. Oil interceptors.

B. Shop Drawings:

1. Provide Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that grease interceptors, oil interceptors, accessories, and components will withstand seismic forces defined in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings: Identify center of gravity and locate & describe mounting and anchorage provisions.
3. Detailed Description: Provide detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Operation and Maintenance Data: To include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical components, devices, and accessories shall be Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of roof penetrations.

B. Coordinate accessories, extensions, collars, flashing clamps, etc… for field conditions and installation requirements for roof assemblies and other construction assemblies to provide final and proper compliant installation.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. General:

1. Available Manufacturers:
   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification

2. Standard: ASME A112.36.2M.
3. Size: Same as connected drainage piping
4. Closure Material: Match pipe, brass, PVC, or ABS

B. Floor Cleanouts:

1. Housing: threaded, adjustable.
2. Type: Threaded, adjustable housing.
3. Body: Cast iron.
4. Outlet Connection: Inside calk, Spigot, or Threaded.
5. Adjustable Housing Material: Cast iron with threads.
6. Frame and Cover Material and Finish: Satin finish nikaloy.
7. Frame and Cover Shape: Round or Square (Contractors Option).
8. Top Loading Classification: Extra Heavy Duty.
9. Riser: ASTM A 74, Service weight, cast-iron drainage pipe fitting and riser to cleanout.
10. Carpet Ring: Yes for carpeted floors.

11. Tile Recess: Yes for tiled floors.
12. Terrazzo: Yes for terrazzo floors

C. Wall Cleanouts:

1. Wall access: Yes
2. Body: Match connected piping.
3. Closure: Countersunk or raised-head, drilled-and-threaded plug.
4. Closure Plug Size: Same as cleanout size but not larger than four inches in diameter.
5. Wall Access: Round, flat, chrome-plated brass, nickel-bronze, copper-alloy, or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Tyler Pipe; Wade Div.
   d. Watts Drainage Products Inc.
   e. Zurn Plumbing Products Group; Light Commercial Operation.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3
3. Pattern: As indicated.
4. Clamping Flange: Required.

2.3 TRENCH DRAINS

A. Trench Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3 for trench drains.
3. Material: Ductile or gray iron.
4. Clamping Flange: Required.
5. Top Loading Classification: Extra Heavy-Duty.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Plastic Stack Fitting (For Use Where Plastic Stacks Are Indicated): ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating (For Use Where Plastic Laboratory Stacks are Indicated: Corrosion resistant on interior of fittings.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. PPP
    b. Josam
    c. Smith
    d. Zurn

2. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
3. Size: Same as floor drain inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

2.6 GREASE INTERCEPTORS

A. General: Grease and solids interceptor having capacity indicated (Refer to Plumbing Schedules).

B. Design: Interceptor shall be designed to remove from wastewater free oil, grease, and other floatable materials, and sediment, sand and other settleable materials.

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

D. Available Manufacturers:
1. GreenTurtleTech
2. Highland Tank
3. Schier Products

E. Equivalent interceptors constructed of fiberglass or steel by other manufacturers will be considered. Interceptor manufacturer must document compliance with all requirements of this specification. Capacity information must be from the manufacturer's catalog. Site constructed concrete interceptors are not acceptable.

F. Interceptor shall meet the requirements of the International Association of Plumbing and Mechanical Officials (IAPMO) Material and Property Standard for Grease Interceptors and Clarifiers ANSI/IAPMO Z1001-2007.

G. Steel Interceptors shall be in accordance with Underwriters Laboratories Inc. Subject UL-1746 Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks.

H. Interceptor shall consist of inlet and outlet connections with internal influent nozzle, non-clogging flow diffusion and energy dissipater baffle. If distributed pipe configuration is proposed pipe diameter shall be twice the diameter of the inlet pipe and shall direct flow across the entire cross-sectional area. Straight pipe is not acceptable.

I. Interceptor shall be designed to prevent large amounts of pipe-clogging fats, oil, and grease (FOG) and solid waste materials from entering the sanitary sewer system. Interceptor shall have compartments to minimize turbulence and promote separation. Interceptor shall retain wastewater long enough to allow liquefied grease to cool down, separate, and congeal.

J. Interceptor shall be suitable for underground installation and shall be installed per the manufacturer's recommendations.

K. Provide interceptor with cleanouts, sample, and ventilation ports together with extension collars, frames, and covers to allow access for removal of oil, grease and solids.

L. Accessories:
1. Basin manways with extensions to grade and heavy duty covers.
2. Full line-size connections.
3. Vertical tee fitting on discharge outlet with pipe to surface with cast iron frame and cover for effluent sampling.
4. Traffic rated components accessories and relieving slabs where installation subject to vehicular traffic.
5. Grease level monitoring and alarm system

M. Warranty: 30 years against leakage, corrosion, and structural failure.

2.7 OIL INTERCEPTORS

A. Oil Interceptors:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
    a. Josam Company; Josam Div.
    b. Schier Products Company.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Type: Draw-off, gravity, factory-fabricated interceptor for separating and removing oil from wastewater. Grease shall be drawn-off and stored in an adjacent tank.
3. Body Material: Cast iron or steel.
4. Interior Lining: Corrosion-resistant enamel or epoxy.
5. Exterior Coating: Corrosion-resistant enamel or epoxy.
6. End Connections: Same as pipe, flanged, hub & spigot, or, threaded.
7. Mounting: Exterior below grade. Provide extension to grade & cover. Provide 6” thick concrete slab all around extension/cover. Provide 1” chamfer on top, exterior edges.

2.8 MOTORS

A. General requirements for motors are specified in Division 22 Section "Common Motor Requirements for Plumbing Equipment."
    1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
    2. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts.

C. Install cleanout deck plates with top flush with finished floor.

D. For wall cleanouts located in concealed piping, install cleanout access covers, with cover tight to finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
    1. Position floor drains as indicated. If indication is not clear, position for easy access and maintenance.
    2. Set floor drains at elevations indicated.

3. Install floor-drain flashing flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain.

F. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

G. Install through-penetration firestop assemblies in plastic conductors and stacks at rated penetrations.

H. Install floor-drain, trap-seal primer fittings on inlet to floor drains indicated to receive trap-seal primer.

I. Install air-gap fittings on RPZ backflow preventers and where indicated.

J. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

K. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction, manufacturer’s recommendations/instructions, and as indicated. In case of a conflict, consult architect.

L. Install oil interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction, manufacturer’s recommendations/instructions, and as indicated. In case of a conflict, consult architect. Coordinate oil-interceptor storage tank and gravity drain with Division 22 Section "Facility Fuel-Oil Piping."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

D. Oil Interceptors: Connect inlet, outlet, vent, and gravity drawoff piping to unit; flow-control fitting and vent to unit inlet piping; and gravity drawoff and suction piping to oil storage tank.

E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
   1. Grease interceptors.
   2. Oil interceptors.
   3. Solids interceptors.

B. Distinguish among multiple units, inform operator of operational requirements, and refer to Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect grease interceptors and their installation, including piping [**and electrical connections,**] and to assist in testing.

B. Checks and Inspections:

   1. Leak Check: After installation, charge system and check for leaks. Repair leaks and recheck until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of open pipes at end of each day or when work stops.

END OF SECTION 221319

SECTION 221413 – FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. PE: Polyethylene plastic.

B. USGBC: United States Green Building Council

1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with a minimum working-pressure rating of 10-foot head of water.

1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of the testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. All cast iron soil pipe and fittings shall be marked with the Collective Trademark of the Cast Iron Soil Pipe Institute.

B. Pipe and Fittings: ASTM A 74, Service class.

C. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. All cast iron soil pipe and fittings shall be marked with the Collective Trademark of the Cast Iron Soil Pipe Institute.

B. Pipe and Fittings: ASTM A 888 or CISPI 301.

C. Hub-less Couplings:
1. All hub-less couplings shall bear the NSF trademark.
2. General: CISPI 310 and ASTM C 1277 assembly of stainless steel corrugated shield, stainless steel bands and fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
1) Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM C 1540, Type 304, stainless-steel shield; stainless-steel bands; and ASTM C 564, rubber sleeve.
a) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
b) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.

b. Heavy-Duty, Cast-Iron Couplings: ASTM A 48/A 48M, 2-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

B. Solvent Cement and Adhesive Primer:
1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).]

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Transition fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Above ground Storm Drainage Piping: Unless indicated otherwise use any of the following piping materials for each size range:
   1. 2” to 4”: Service class, cast-iron soil piping; gaskets; and gasketed joints.
   2. 2” to 4”: Hub-less, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
      b. Couplings: Heavy-duty, cast iron.
   3. 5” and 6”: Service class, cast-iron soil piping; gaskets; and gasketed joints.
   4. 5” and 6”: Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
      b. Couplings: Heavy-duty, cast iron.
   5. 8” and Larger: Service class, cast-iron soil piping; gaskets; and gasketed joints.
   6. 8” and Larger: Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
      b. Couplings: Heavy-duty, cast iron.

C. Underground Storm Drainage Piping: Use any of the following piping materials for each size range:
   1. 2” to 4”: Service class, cast-iron soil piping; gaskets; and gasketed joints.
   2. 2” to 4”: Hub-less, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
      b. Couplings: Heavy-duty, cast iron.
   3. 2” & Larger: Schedule 40 PVC pipe, PVC socket fittings, and solvent-cemented joints.
   4. 5” and 6”: Service class, cast-iron soil piping; gaskets; and gasketed joints.
   5. 5” and 6”: Hub-less, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
      b. Couplings: Heavy-duty, cast iron.
   6. NPS 8and Larger: Service class, cast-iron soil piping; gaskets; and gasketed joints.
   7. NPS 8 and Larger: Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
      b. Couplings: Heavy-duty, cast iron.

3.3 PIPING INSTALLATION

A. Refer to Section " Storm Utility Drainage Piping" for Project site storm sewer and drainage piping.

B. Refer to Section "Common Work Results for Plumbing" for basic piping installation.

C. Refer to Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices in zones other than A & B.

D. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Section "Storm Drainage Piping Specialties".

E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

F. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

I. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

K. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

L. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section "Sleeves and Sleeve Seals for Plumbing Piping."

M. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section "Escutcheons for Plumbing Piping."

3.4 JOINT CONSTRUCTION

A. Refer to Section "Common Work Results for Plumbing" for basic piping joint construction.

B. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.5 VALVE INSTALLATION

A. Backwater Valves: Install backwater valves in piping subject to backlog.
   1. Horizontal Piping: Horizontal backwater valves.
   2. Install backwater valves in accessible locations.
   3. Refer to Section "Storm Drainage Piping Specialties" for backwater valves.

3.6 HANGER AND SUPPORT INSTALLATION

A. Refer to Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices in zones other than A & B.

B. Refer to Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices. Install the following:
   1. Vertical Piping: MSS Type 8 or Type 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs: According to the following:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
   3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Section "Hangers and Supports for Plumbing Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
   1. 1 ½" and 2": 60" with 3/8" rod.
   2. 3": 60" with ½" rod.
   3. 4" and 5": 60" with 5/8" rod.
   4. 6": 60" with ¾" rod.
   5. 8" to 12": 60" with 7/8" rod.
   6. 15": 60" inches with 1" rod.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
   4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   5. Prepare reports for tests and required corrective action.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221413

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 ABBREVIATIONS

A. AFF Above Finished Floor.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 ROOF DRAINS

A. General-Purpose Roof Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawing Schedule or comparable product by one of the following:
    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe.
    d. Watts Water Technologies, Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: Cast iron.
4. Combination Flashing Ring and Gravel Stop: Required.
5. Underdeck Clamp: Required.
6. Sump Receiver Plate: Not required.
7. Dome Material: Aluminum.
8. Extension collar required.

B. Cornice, Sill, and Gutter Roof Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawing Schedule or comparable product by one of the following:

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe.
    d. Watts Water Technologies, Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.4, for cornice and gutter roof drains.
3. Body Material: Metal.
4. Dimension of Body: Nominal 6-inch diameter.
5. Dome Material: Bronze.

C. Parapet Roof Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawing Schedule or comparable product by one of the following:

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe.
    d. Watts Water Technologies, Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.4, for parapet roof drains.
3. Body Material: Cast iron.
4. Grate Material: Bronze.

2.2 OVERFLOW ROOF DRAINS

A. General-Purpose Overflow Roof Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawing Schedule or comparable product by one of the following:

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe.
    d. Watts Water Technologies, Inc.
    e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: Cast iron.
4. Combination Flashing Ring and Gravel Stop: Required.
5. Underdeck Clamp: Required.
6. Sump Receiver Plate: Not required.
7. Dome Material: Aluminum.

2.3 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Downspout Boots:

1. Description: Subject to compliance with requirements, provide product indicated on Drawing Schedule or comparable product by one of the following:
2. Available manufacturers
   a. JR Smith Manufacturing
   b. Josam Company
   c. Zurn
3. Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 outlet; and shop-applied bituminous coating.
4. Size: Inlet size to match downspout and NPS 4 outlet.

B. Storm Drain and Storm Drain Overflow Nozzles: Subject to compliance with requirements, provide product indicated on Drawing Schedule or comparable product by one of the following:
1. Available manufacturers
   a. JR Smith Manufacturing
   b. Josam Company
   c. Zurn
2. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
3. Size: Same as connected conductor
4. Product is for use where storm drain piping or secondary storm drain piping exits the building above grade and shall be provided where indicated on the drawings.

2.4 CLEANOUTS

A. General:

1. Available Manufacturers:
   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification
2. Standard: ASME A112.36.2M.
3. Size: Same as connected drainage piping
4. Closure Material: Match pipe, brass, PVC, or ABS

B. Floor Cleanouts:

1. Housing: threaded, adjustable.
2. Type: Threaded, adjustable housing.
3. Body: Cast iron.
4. Outlet Connection: Inside calk, Spigot, or Threaded.
5. Adjustable Housing Material: Cast iron with threads.
6. Frame and Cover Material and Finish: Satin finish nikaloy.
7. Frame and Cover Shape: Round or Square (Contractors Option).
8. Top Loading Classification: Extra Heavy Duty.
9. Riser: ASTM A 74, Service weight, cast-iron drainage pipe fitting and riser to cleanout.

10. Carpet Ring: Yes for carpeted floors.
11. Tile Recess: Yes for tiled floors.
12. Terrazzo: Yes for terrazzo floors

C. Wall Cleanouts:

1. Wall access: Yes
2. Body: Match connected piping.
3. Closure: Countersunk or raised-head, drilled-and-threaded plug.
4. Closure Plug Size: Same as cleanout size but not larger than four inches in diameter.
5. Wall Access: Round, flat, chrome-plated brass, nickel-bronze, copper-alloy, or stainless-steel cover plate with screw.

2.5 BACKWATER VALVES

A. Horizontal, Backwater Valves :

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.14.1.
3. Size: Same as connected piping.
4. Cover: Bolted or threaded access to check valve.
5. End Connections: Match connecting pipe.
6. Check Valve: Factory assembled to hang open for airflow unless subject to backflow condition.
7. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at grade; replaces backwater valve cover. Terminate in 4” thick square concrete slab 4” larger all around than cover (provide 1” chamfer on top edges).

2.6 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

5. Plastic Stack Fitting (For Use Where Plastic Stacks Are Indicated): ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains where indicated. Create low points in roof areas according to roof membrane manufacturer's written installation instructions. Install flashing ring, collar, or flange to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

B. Install downspout boots at grade. Secure to building wall.

C. Install storm drain and storm drain overflow nozzles at exposed bottom of storm drain and storm drain overflow conductors where they spill onto grade.

D. Install cleanouts in aboveground piping and building drain piping according to the International Plumbing Code.

E. Install cleanouts for piping below floors.

F. Install cleanout deck plates with top flush with finished floor.

G. For wall cleanouts located in concealed piping, install cleanout wall access covers with cover tight to finished wall.

H. Install horizontal backwater valves where indicated.

I. Install concrete slabs at backwater valves.

J. Install cleanouts in vertical conductors at 18” AFF.

K. Install access door in wall if required to access cleanout.

L. Install through-penetration firestop assemblies at penetrations of rated assemblies.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 PROTECTION

A. Protect drains during construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of open piping at end of each day or when work stops.

END OF SECTION 221423

SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type and size of domestic-water heater proposed. Include rated capacities, operating characteristics, electrical characteristics, furnished specialties and accessories.

B. LEED Submittal: Product Data for Prerequisite EA 2: Documentation indicating that units comply with ASHRAE/IESNA 90.1, Section 7, "Service Water Heating."

C. Wiring Diagrams: For power, signal, and control wiring.

D. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

E. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

F. Warranty: Sample of warranty.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA 90.1 Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.4 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.5 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period from date of Substantial Completion:

a. Storage Tank(s): Five years.
b. Controls and Other Components: One year.
c. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 GAS-FIRED, TANK-LESS, DOMESTIC-WATER HEATERS

A. Standard: ANSI Z21.10.3/CSA 4.3 for gas-fired, instantaneous, domestic-water heaters for indoor application.

B. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.

1. Tappings: ASME B1.20.1 pipe thread.
2. Pressure Rating: 150 psig
3. Heat Exchanger: Copper tubing.
4. Insulation: Comply with ASHRAE/IESNA 90.1.
5. Jacket: Metal, with enameled finish, or plastic.
6. Burner: For use with tank-less, domestic-water heaters and natural-gas fuel.
7. Automatic Ignition: Manufacturer's proprietary system for automatic, gas ignition.
8. Temperature Control: Adjustable thermostat.

C. Support: Bracket for wall mounting.

D. Capacity and Characteristics: Refer to Plumbing drawings and schedules.

1. Minimum Vent Diameter: Refer to and coordinate with manufacturer’s written installation recommendations and Mechanical drawings and schedules.

E. Domestic-Water Compression Tanks:

1. Available Manufacturers:

    a. Navien.
    b. Noritz

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. The basis of design for each Compression Tank shall be as indicated. The contractor shall provide an equivalent product.

B. Domestic-Water Compression Tanks:

1. Available Manufacturers:

    a. AMTROL Inc.
    b. Honeywell International Inc.
    c. Pentair Pump Group (The); Myers.
    d. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
    e. State Industries.
    f. Taco, Inc.
    g. Hubbell

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

C. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than ¾” with ASME B1.20.1 pipe threads.

D. Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2 Heat-Trap Fitting.

E. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

F. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include rating to match gas supply & water heater requirement.

G. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank. ANSI Z21.22/CSA 4.4-M or ASME rated and stamped.

H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

I. Plug and cord:
1. Where water heaters require 120 volt single phase power, provide a plug and cord, for connection to a standard grounded outlet.
2. Cord length: As required to reach outlet, 6’-0” maximum.
3. Plug and cord ampacity shall be approved by the water heater manufacturer.

J. Intake Venting:
   1. Air Intake Termination: PVC gooseneck elbow with bird screen.
   2. CPVC/PVC as recommended by water heater manufacturer.

2.3 SOURCE QUALITY CONTROL

A. Run/fire water heaters prior to shipment.

B. Hydrostatically test water heaters and storage tanks to minimum of one and one-half times pressure rating prior to shipment.

C. Domestic-water heaters will be considered defective if they leak or do not operate correctly. Comply with requirements in Section "Quality Requirements" for re-testing and re-inspecting requirements and Section "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base.

   1. Maintain manufacturer's recommended clearances.

B. Install commercial domestic-water heaters with seismic-restraint devices.

C. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief-valve outlet, with drain piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install water-heater tank drain as indicated. Install hose-end drain valves. Comply with requirements for hose-end drain valves specified in Section "Domestic Water Piping Specialties."

E. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Division 22 Section "Meters and Gages for Plumbing Piping."

F. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet. Comply with requirements for valves specified in Division 22 Section "General-Duty Valves for Plumbing Piping," and comply with requirements for thermometers specified in Division 22 Section "Meters and Gages for Plumbing Piping."

G. Install heat traps on inlet and outlet piping.

H. Fill with water.

I. Charge compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section "Domestic Water Piping."

B. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Where installing piping adjacent to water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section "Quality Requirements" for retesting and reinspecting requirements and Section "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train. Train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

END OF SECTION 223400

SECTION 224200 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following conventional plumbing fixtures and related components:

1. Water closets.
2. Lavatories.
3. Commercial sinks.
4. Kitchen sinks.
5. Service sinks.
6. Service basins.
7. Showers
8. Hydrants

B. Related Sections include the following:

1. Division 10 Section "Toilet, Bath, and Laundry Accessories."
2. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.
3. Division 22 Section "Security Plumbing Fixtures."
4. Division 22 Section “Emergency Plumbing Fixtures.”

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

D. FRP: Fiberglass-reinforced plastic.

E. PMMA: Polymethyl methacrylate (acrylic) plastic.

F. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

E. LEED Submittals:

1. Credit WE 3: Manufacturers' data for each type of plumbing fixture indicating flow and flush rates.

2. Credit EQ 4.1: Manufacturers' product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product in grams per Liter (g/L).

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.
2. Vitreous-China Fixtures: ASME A112.19.2M.

H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Supply Fittings: ASME A112.18.1.
12. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Manual-Operation Flushometers: ASSE 1037.
4. Brass Waste Fittings: ASME A112.18.2.
5. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Floor Drains: ASME A112.6.3.
2. Grab Bars: ASTM F 446.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Off-Floor Fixture Supports: ASME A112.6.1M.
5. Pipe Threads: ASME B1.20.1.
6. Plastic Toilet Seats: ANSI Z124.5.
7. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
3. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 2 of each type.
4. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
5. Water-Closet Tank, Repair Kits: Equal to 5 percent of amount of each type installed.
6. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 WATER COOLERS

A. BI-LEVEL WATER COOLER - ACCESSIBLE (EWC-1):
1. Manufacturer & Model Number: Elkay Model EZSTL8C
   a. Self-contained wall hung electric refrigerated water cooler
   b. Push bar activation on front, left, & right of unit.
   c. Built-in flow regulator
   d. Connect to water supply using dielectric coupling.
   e. Polyester elastomer flexible bubbler.
   f. Provide non-metallic strainer.
   g. Provide quick connect fittings.
   h. Provide cane apron on upper fountain.
   i. Material: Stainless steel.
   j. Color: Manufacturer’s standard.
   k. Electrical: 115V, 1 PH, 60 HZ, 4.0 Full load amps, 370 Watts.
2. Supply: McGuire Part Number 2165-N3-F
   a. ½” IPS x 3/8” OD
   b. ½” x 3” chrome plated brass nipple.
   c. Heavy brass chrome plated wall flange with set-screw
   d. Provide dielectric connection.
3. Provide 1½”diameter plastic tailpiece extension. Electrically isolate cooler from drainage and vent system.
4. Trap: McGuire Part Number 8912-C-F
   a. Size:1-1/2”x 1-1/2”
   b. Material: Polished chrome plated cast brass.
   c. Cleanout plug: Yes
   d. Nuts: Polished chrome plated brass.
   e. Wall bend: 17-gauge seamless tubular chrome plated brass.

f. Wall flange: Chrome plated brass with setscrew. Where drain pipe connection protrudes from wall contractor may provide deep flange.

5. Other Manufacturers: Provide products, features, and accessories equal to those specified above.
   a. Drinking Fountain:
      1) Acorn Aqua
      2) Haws Corp
      3) Oasis
   b. Trap:
      1) Kohler
      2) Cambridge Brass

2.2 LAVATORIES

A. WALL HUNG LAV – ACCESSIBLE (LA-1) WITH MANUAL FAUCET

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kohler No. K-1728 or a comparable product by one of the following:

   a. Material: Vitreous china

   b. Color: White

2. Faucet: Moen Model: 8820
   a. 4” Spout
   b. 0.5 GPM Maximum Flow
   c. Chrome plate
   d. All Brass Body
   e. Renewable Seat and Washers
   f. Wrist Blade Handles

3. Drain: McGuire Part Number 155A

4. Trap: McGuire Part Number 8902C-F
   1) 1-1/4”x 1-1/2” cast brass polished chrome trap with cleanout plug and brass slip nuts.
   2) 17-gauge seamless tubular chrome plated brass wall bend.
   3) Forged brass chrome plated wall flange with setscrew.

5. Supplies: McGuire Part Number 2165-N3-F
   1) ½” IPS x 3/8” OD
   2) ½” x 3” chrome plated brass nipple.
   3) Heavy brass chrome plated wall flange with set-screw
   4) Contractor shall coordinate supply connection to faucet.

6. Insulation: Tru-Bro Lav Guard #102
   1) Color: White
   2) Insulate P-trap, hot and cold angle valves, hot and cold risers.

7. Carrier: Josam Series 17100
   a. Floor mounted with rectangular uprights.

8. Other Manufacturers: Provide products, features, and accessories equal to those specified above.
    1) Lavatory
        a) American Standard
        b) Eljer
        c) Gerber
    2) Faucet:
        a) Speakman
        b) Cambridge Brass
        c) T&S Brass
    3) Drain:
        a) Kohler
        b) Cambridge Brass
        c) Chicago
    4) Trap:
        a) Kohler
        b) Cambridge Brass
    5) Supplies:
        a) Cambridge Brass
        b) Kohler
    6) Insulation:
        a) McGuire

B. WALL HUNG LAV – (LA-2) WITH MANUAL FAUCET

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kohler No. K-1728 or a comparable product by one of the following:

    a. Material: Vitreous china

    b. Color: White

2. Faucet: Moen Model: 8820
    a. 4” Spout
    b. 0.5 GPM Maximum Flow
    c. Chrome plate
    d. All Brass Body
    e. Renewable Seat and Washers
    f. Wrist Blade Handles

3. Drain: McGuire Part Number 155A

4. Trap: McGuire Part Number 8902C-F
    1) 1-1/4”x 1-1/2” cast brass polished chrome trap with cleanout plug and brass slip nuts.
    2) 17-gauge seamless tubular chrome plated brass wall bend.
    3) Forged brass chrome plated wall flange with setscrew.

5. Supplies: McGuire Part Number 2165-N3-F
    1) ½” IPS x 3/8” OD
    2) ½” x 3” chrome plated brass nipple.
    3) Heavy brass chrome plated wall flange with set-screw

4) Contractor shall coordinate supply connection to faucet.

6. Insulation: Tru-Bro Lav Guard #102
   1) Color: White
   2) Insulate P-trap, hot and cold angle valves, hot and cold risers.
7. Carrier: Josam Series 17100
   a. Floor mounted with rectangular uprights.
8. Other Manufacturers: Provide products, features, and accessories equal to those specified above.
   1) Lavatory
      a) American Standard
      b) Eljer
      c) Gerber
   2) Faucet:
      a) Speakman
      b) Cambridge Brass
      c) T&S Brass
   3) Drain:
      a) Kohler
      b) Cambridge Brass
      c) Chicago
   4) Trap:
      a) Kohler
      b) Cambridge Brass
   5) Supplies:
      a) Cambridge Brass
      b) Kohler
   6) Insulation:
      a) McGuire

2.3 SERVICE BASIN

A. SERVICE MOP BASIN (32”X32”) (MB-1)

B. Manufacturer & Model Number: Stern-Williams Serviceptor Model SB-702
   1. Shoulders shall not be less than 9" high inside measurement, and not less than 1" wide. The tiling flange shall be cast integral to the unit and shall extend 1" above the shoulder on 2 sides. Basin shall be composed of marble chips and Portland cement ground smooth and sealed to resist stains. A one piece, 20 gauge, type 302 stainless steel stainless steel cap shall be integrally cast into the unit on four sides.
      a. Dimensions: 32”x 32”x 12”.
      b. Cap: Stainless steel on 4 sides.
      c. Tiling Flange: Yes on two sides.
      d. Material: Terrazzo
      e. Color: Manufacturer’s standard

C. Faucet: Moen Model 8232
   1. 8” center

2. Vacuum breaker spout
3. Lever Handles
4. Integral supply check-stops
5. Pail hook
6. Wall support

D. Drain: Cast brass with stainless steel strainer or equal as furnished with sink.

E. Trap: 3” (Provide additional pipe and material transition as required make connection to sink)

F. Other Manufacturers: Provide products, features, and accessories equal to those specified above.

1. Service Sink
   a. Fiat
   b. Just
   c. Florestone
2. Faucet:
   a. T&S
   b. Chicago
   c. Speakman

2.4 SH-1 (INDIVIDUAL SHOWER (TRANSFER TYPE ACCESSIBLE))

1. Manufacturer & Model Number: Comfort Designs SST 3838 BF 1.0 RRF - ANSI
   a. Transfer-type one piece solid surface barrier-free shower.
   b. Rough-in Dimensions: 38” x 37-1/4” x 78-7/8”
   c. Inside Dimensions: 36” x 36” x 78”
   d. Folding Seat (Refer to drawings for Hand)
   e. Wall mounted brushed stainless steel grab bars
   f. Slip Resistant Floor
   g. Wall Pattern: Subway Tile

2. Shower Valve Manufacturer and Model: Symmons C-96-500-B30-V-X
   a. 2.0 GPM controlled flow restricted head
   b. Lever Handle
   c. Multi-stream showerhead
   d. Hand shower wand with 5 foot metal hose
   e. 30” slide bar
   f. Temperature and Pressure balancing shower valve with check stops.
   g. Diverting valve
3. Other Manufacturers: Provide products, features, and accessories equal to those specified above.
   a. Shower Valve
      1) Speakman
      2) Acorn
      3) Bradley
4. Provide self-sealing chrome plated brass drain and strainer.

2.5 SH-2 (INDIVIDUAL SHOWER)

1. Manufacturer & Model Number: Comfort Designs SSS 3636 SH - WHG
   a. Transfer-type one piece solid surface barrier-free shower.
   b. Rough-in Dimensions: 37-1/4” x 35-3/4” x 77-1/2”
   c. Inside Dimensions: 36” x 36” x 77”
   d. Slip Resistant Floor
   e. Wall Pattern: Subway Tile

2. Shower Valve Manufacturer and Model: Symmons 5891TRM
   a. 2.0 GPM controlled flow restricted head
   b. Lever Handle
   c. Multi-stream showerhead
   d. Temperature and Pressure balancing shower valve with check stops.

3. Other Manufacturers: Provide products, features, and accessories equal to those specified above.
   a. Shower Valve
      1) Speakman
      2) Acorn
      3) Bradley
4. Provide self-sealing chrome plated brass drain and strainer.

2.6 SINKS

A. SINK – ACCESSIBLE (SK-1)

1. Basis-of-Design Product: Manufacturer & Model Number: Elkay LRADQ-2219
   a. Overall Length (left to right):22.00”
   b. Overall Width (front to back): 19.50”
   c. Inside Bowl Depth: 5.5”
   d. Material: 18 Gauge Stainless Steel
   e. Number of Bowls: 1
   f. Drain location: Off-center, rear.
   g. Mounting: Inside hole ratchet system equal to Elkay Quick-Clip® mounting system. Systems requiring access from below shall not be permitted.
   h. Deck Hole drilling configuration:
      1) 3 holes, 4”apart, centered.
2. Faucet: Chicago 1100-317VPABCP
   a. Hole configuration: 3 Hole installation, 4” centers.
   b. Spout: 8” long swing spout.
   c. Handles: 4” wristblade.
   d. Aerator: Vandal resistant, pressure compensating, 2.2 gpm
   e. Cartridges: Ceramic or compression ¼ turn.
   f. Meets ADA requirements: Yes
   g. Other:
      1) Red & blue temperature indicators. Red = Hot, blue = cold.
3. Basket Strainer & Tail Piece: McGuire Part Number 151
   a. Material: Forged brass, chrome plated.
   b. Tailpiece: 1-1/2” x 4” 20 gauge seamless brass, chrome plated.

c. Nuts: Cast brass lock, slip, and coupling, chrome plated

4. Trap: McGuire Part Number 8912-C-F
   a. Size:1-1/2"x 1-1/2"
   b. Material: Polished chrome plated cast brass.
   c. Cleanout plug: Yes
   d. Nuts: Polished chrome plated brass.
   e. Wall bend: 17-gauge seamless tubular chrome plated brass.
   f. Wall flange: Chrome plated brass with setscrew. Where pipe protrudes from wall contractor may provide deep flange.
5. Supplies: McGuire Part Number 2167-N3-F
   a. Inlet: ½" IPS
   b. Outlet: ½" OD compression.
   c. Nipple: ½" x 3" chrome plated brass.
   d. Wall flange: Heavy brass chrome plated with set-screw
6. Insulation: Tru-Bro Lav Guard #102
   a. Insulate P-trap, hot and cold angle valves, hot and cold risers.
7. Other Manufacturers: Provide products, features, and accessories equal to those specified above.
   a. Sink
      1) Kohler
      2) Just
      3) Eagle Group
   b. Faucet:
      1) Chicago
      2) T&S
      3) Speakman
   c. Basket Strainer & Tail Piece:
      1) Kohler
      2) Cambridge Brass
   d. Trap:
      1) Kohler
      2) Cambridge Brass
   e. Supplies:
      1) Chicago
      2) Cambridge Brass
      3) T&S

B. SINK – ACCESSIBLE (SK-2)
1. Basis-of-Design Product: Manufacturer & Model Number: Elkay ECTRUAD281755
   a. Overall Length (left to right):28.00"
   b. Overall Width (front to back): 18.50"
   c. Inside Bowl Depth: 6.0"
   d. Material: 18 Gauge Stainless Steel
   e. Number of Bowls: 1
   f. Drain location: Off-center, rear.
   g. Mounting: Undermount Clip
   h. Deck Hole drilling configuration:
      1) 3 holes, 4"apart, centered.
2. Faucet: Chicago 1100-317VPABCP

a. Hole configuration: 3 Hole installation, 4" centers.
b. Spout: 8" long swing spout.
c. Handles: 4" wristblade.
d. Aerator: Vandal resistant, pressure compensating, 2.2 gpm
e. Cartridges: Ceramic or compression ¼ turn.
f. Meets ADA requirements: Yes
g. Other:
    1) Red & blue temperature indicators. Red = Hot, blue = cold.

3. Basket Strainer & Tail Piece: McGuire Part Number 151
    a. Material: Forged brass, chrome plated.
    b. Tailpiece: 1-1/2" x 4" 20 gauge seamless brass, chrome plated.
    c. Nuts: Cast brass lock, slip, and coupling, chrome plated
4. Trap: McGuire Part Number 8912-C-F
    a. Size:1-1/2"x 1-1/2"
    b. Material: Polished chrome plated cast brass.
    c. Cleanout plug: Yes
    d. Nuts: Polished chrome plated brass.
    e. Wall bend: 17-gauge seamless tubular chrome plated brass.
    f. Wall flange: Chrome plated brass with setscrew. Where pipe protrudes from wall contractor may provide deep flange.
5. Supplies: McGuire Part Number 2167-N3-F
    a. Inlet: ½" IPS
    b. Outlet: ½" OD compression.
    c. Nipple: ½" x 3" chrome plated brass.
    d. Wall flange: Heavy brass chrome plated with set-screw
6. Insulation: Tru-Bro Lav Guard #102
    a. Insulate P-trap, hot and cold angle valves, hot and cold risers.
7. Other Manufacturers: Provide products, features, and accessories equal to those specified above.
    a. Sink
        1) Kohler
        2) Just
        3) Eagle Group
    b. Faucet:
        1) Chicago
        2) T&S
        3) Speakman
    c. Basket Strainer & Tail Piece:
        1) Kohler
        2) Cambridge Brass
    d. Trap:
        1) Kohler
        2) Cambridge Brass
    e. Supplies:
        1) Chicago
        2) Cambridge Brass
        3) T&S

C. (**SK-3**) COMPOSITE UTILITY SINK

1. Basis-of-Design Product: Manufacturer & Model Number: Fiat - FL-1
   a. General: Polypropylene Single tub with legs.
   b. Material: Plastic
   c. Number of Bowls: 1
   d. Drain location: Center.
   e. Deck Hole drilling configuration:
      1) 3 holes, 4”apart, centered.
2. Faucet: Chicago Model 895-L12
   a. 4” center
   b. 2-3/8” Lever Handles
3. Supplies: McGuire Part Number 2167-N3-F
   a. Inlet: ½” IPS
   b. Outlet: ½” OD compression.
   c. Nipple: ½” x 3” chrome plated brass.
   d. Wall flange: Heavy brass chrome plated with set-screw
4. Drain: McGuire Part Number 152N
   a. Brass basket strainer with 4” long 1-1/2” diameter 17 gage tailpiece.
5. Trap: McGuire Part Number 8912-C-F
   a. Size: 1-1/2” x 1-1/2”
   b. Material: Polished chrome plated cast brass.
   c. Cleanout plug: Yes
   d. Nuts: Polished chrome plated brass.
   e. Wall bend: 17-gauge seamless tubular chrome plated brass.
   f. Wall flange: Chrome plated brass with setscrew. Where pipe protrudes from wall contractor may provide deep flange.
6. Other Manufacturers: Provide products, features, and accessories equal to those specified above.
   a. Sink:
      1) Swan Corporation
      2) Crane
   b. Faucet:
      1) T&S
      2) Speakman
      3) Moen
   c. Drain:
      1) Kohler
      2) Cambridge Brass
   d. Trap:
      1) Kohler
      2) Cambridge Brass

2.7 WATER CLOSETS

A. WATER CLOSET - ACCESSIBLE (WC-1) WITH MANUAL FLUSH VALVE:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kohler No. K-96057 (1.28 Gallon Flush)

a. Material: Vitreous china
b. Color: White

2. Flush Valve: Sloan Model 111XL-1.28 (1.28 Gallon Flush)
   a. Supply Rough-in Elevation: 11-1/2" above spud connection
   b. Provide:
      1) Accessible handle located on wide side of approach..
      2) Sweat Solder Adapter and Cast Wall Flange with Set Screw.
3. Seat: Church 9500SSCT (White)
      1) Elongated extra heavy weight seat with stainless steel self-sustaining check hinge.
      2) Open front, no cover

B. WATER CLOSET - (WC-2) WITH MANUAL FLUSH VALVE:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kohler No. K-96053 (1.28 Gallon Flush)

   a. Material: Vitreous china

   b. Color: White

2. Flush Valve: Sloan Model 111XL-1.28 (1.28 Gallon Flush)
   a. Supply Rough-in Elevation: 11-1/2" above spud connection
   b. Provide:
      1) Accessible handle located on wide side of approach..
      2) Sweat Solder Adapter and Cast Wall Flange with Set Screw.
3. Seat: Church 9500SSCT (White)
      1) Elongated extra heavy weight seat with stainless steel self-sustaining check hinge.
      2) Open front, no cover
      3) Open front, no cover

2.8 WALL HYDRANT (WH-1)

A. Manufacturer & Model Number: Josam Hydrasan 71000 non-freeze w/box.

B. General: Cast bronze, non-freeze, wall hydrant with cast bronze box, satin finish face, hinged latching cover, control key,and integral vacuum breaker/backflow preventer. Pressure rating shall be 125 psig. C (860 kPa)omply with ASME A112.21.3M, ASSE 1011, and ASSE 1019. Provide self-draining integral non-removable hose-connection, and wall clamp.

1. Inlet: (DN 20 or DN 25)¾" threaded or solder joint.
2. Outlet: ASME B1.20.7, garden-hose threads.
3. Operating Keys: One with each hydrant.

C. Other Manufacturers:

1. Smith
2. Woodford
3. Zurn

2.9 WALL SUPPLY BOX - ICE MAKER (WSB-1)

A. Manufacturer: Oatey

B. General: Recessed-mounting, 20 gauge steel, outlet box& faceplate with supply fitting complying with ASME A112.18.1M. Include box with faceplate, supply valve, and reinforcement

C. Supply valve: ½" IPS (or copper sweat) x 3/8" OD

D. Available Manufacturers

1. Guy Gray
2. Water-tite
3. LSP Products Group.

2.10 HOSE BIBB (HB-1)

A. Manufacturer and Model Number: Apollo Model HB

1. Vacuum Breaker: Yes (separate). Apollo 38-304
2. Outlet: ASME B1.20.7, garden-hose threads.
3. ¾" Inlet
4. Ball valve ¼ turn or compression.
5. Brass Construction
6. Aluminum, brass, stainless steel, or steel handle

B. Available Manufacturers:

1. T&S
2. Chicago
3. Arrowhead Brass

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install counter-mounting fixtures in and attached to casework.

G. Install fixtures level and plumb according to roughing-in drawings.

H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

K. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

L. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

M. Install toilet seats on water closets.

N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

P. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install shower flow-control fittings with specified maximum flow rates in shower arms.

R. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

S. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

T. Set service basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

U. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224200

SECTION 224500 - EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

1. This Section includes the following emergency plumbing fixtures:

    1. Eye/face wash equipment.

2. Related Sections include the following:

    1. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers.
    2. Division 22 Section "Sanitary Waste Piping Specialties" for floor drains.

1.3 DEFINITIONS

1. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.

2. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.

3. Tepid: Moderately warm.

1.4 SUBMITTALS

1. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.

2. Product Certificates: Submit certificates of performance testing specified in "Source Quality Control" Article.

3. Field quality-control test reports.

4. Operation and Maintenance Data: For emergency plumbing fixtures to include in maintenance manuals.

1.5 QUALITY ASSURANCE

1. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."

2. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act" ; and Public Law 101-336, "Americans with Disabilities Act" ; for plumbing fixtures for people with disabilities.

3. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 COMBINATION UNITS

1. EYE/FACE WASH - ACCESSIBLE **(EW-1)**:
    1. Manufacturer & Model Number: Bradley model S19224DCFW
        a. Barrier-free accessibility
        b. Stainless steel bowl
        c. Stainless steel eye/face wash push handle
        d. Face spray ring
        e. Bowl dust cover
        f. Integral flow control in sprayhead assembly
        g. Chrome-plated brass stay-open ball valves
        h. Stainless steel drench shower pull handle
        i. Minimum flow shall be 2.0gpm
        j. Powder Coated finish

    2. Emergency Mixing Valve: Bradley model S19-2150-RS (EFX20)
        a. Adjustable set point with temperature range
        b. Bronze valve body
        c. Set for 85° F.
        d. Positive shutoff of hot supply when cold supply is lost.
        e. Capable of 4 GPM minimum on loss of hot water supply.
        f. All flow is shut-off in event of thermostatic failure.
        g. Equipped with checkstops and strainers.
        h. Wall support.
        i. 1” inlets.
        j. 1-1/4” outlet.
        k. 18ga min. recessed stainless steel locking hinged cabinet.

    3. Other Manufacturers: Provide products, features, and accessories equal to those specified above.
        1) Haws Corp
        2) Encon
        3) Guardian

2.2 SOURCE QUALITY CONTROL

1. Certify performance of plumbed emergency plumbing fixtures by independent testing agency acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

1. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.
    1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

1. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.
2. Install fixtures level and plumb.
3. Fasten fixtures to substrate.
4. Install shutoff valves in water-supply piping to fixtures. Use ball, gate, or globe valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
    1. Exception: Omit shutoff valve on supply to emergency equipment if prohibited by authorities having jurisdiction.
5. Install dielectric fitting in supply piping to fixture if piping and fixture connections are made of different metals. Dielectric fittings are specified in Division 22 Section "Common Work Results for Plumbing."
6. Install thermometers in supply and outlet piping connections to water-tempering equipment. Thermometers are specified in Division 22 Section "Meters and Gages for Plumbing Piping."
7. Install trap and waste to wall on drain outlet of fixture receptors that are indicated to be directly connected to drainage system.
8. Install indirect waste piping to wall on drain outlet of fixture receptors that are indicated to be indirectly connected to drainage system. Drainage piping is specified in Division 22 Section "Sanitary Waste and Vent Piping."
9. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

10. Install equipment nameplates or equipment markers on fixtures and equipment signs on water-tempering equipment. Identification materials are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.3 CONNECTIONS

1. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

2. Connect cold-water-supply piping to plumbed emergency plumbing fixtures not having water-tempering equipment.

3. Connect hot- and cold-water-supply piping to hot- and cold-water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures.

4. Directly connect emergency plumbing fixture receptors with trapped drain outlet to sanitary drainage and vent piping.

5. Indirectly connect emergency plumbing fixture receptors without trapped drain outlet to sanitary or storm drainage piping.

3.4 FIELD QUALITY CONTROL

1. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities and temperatures.

2. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3. Report test results in writing.

3.5 ADJUSTING

1. Adjust or replace fixture flow regulators for proper flow.

2. Adjust equipment temperature settings.

END OF SECTION 224500

SECTION 224600 – SECURITY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 ABBREVIATIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FRP: Fiberglass-reinforced plastic.

C. PMMA: Polymethyl methacrylate (acrylic) plastic.

D. PVC: Polyvinyl chloride plastic.

E. RFI: Request for information.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Accessible Service Space: Service area in secure space behind wall-mounted fixtures.

C. Back-Access Fixture: Security plumbing fixture designed to mount on wall sleeve built into wall or on wall, so installation and removal of fixture, piping, and other components are accessible only from service space behind wall.

D. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

E. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

F. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, showerheads and tub spouts, drains and tailpieces, and traps and waste pipes.

G. Front Access Fixture: Security plumbing fixture designed to mount on wall with installation and removal from fixture side of wall, and with piping and other components accessible only from access panel in fixture.

H. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

I. Other Manufacturers: Use one of those listed.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and security anchors for security plumbing fixtures.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For security plumbing fixtures and components to include in maintenance manuals.

B. Faucet Cartridges, washers, aerators and O-Rings: Equal to five percent (5%) of amount of each type and size installed but not less than five (5) of each type and size.

C. Flushometer Valve Repair Kits: Equal to ten percent (10%) of quantity of each type installed, or six (6), whichever is less.

D. Provide one (1) for ten percent (10%) of each size or ten (10), whichever is less key operators (wrenches/tools) for loose key stops, wall hydrants, aerators, [security fasteners] and any fixture where a key, [security fastener,] or special tool is required.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Electrical components, devices, and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities. Comply with requirements in Public Law 102-486, "Energy Policy Act," regarding water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are

compatible.

F. Comply with the following standards and other requirements where applicable:

1. Slip-Resistant Bathing Surfaces: ASTM F 462.
2. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.
3. Stainless-Steel Residential Sinks: ASME A112.19.3.
4. Water-Closet, Flushometer Tank Trim: ASSE 1037.
5. Faucets: ASME A112.18.1.
6. Hose-Connection Vacuum Breakers: ASSE 1011.
7. Hose-Coupling Threads: ASME B1.20.7.
8. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
9. NSF Potable-Water Materials: NSF 61.
10. Pipe Threads: ASME B1.20.1.
11. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
12. Supply Fittings: ASME A112.18.1.
13. Brass Waste Fittings: ASME A112.18.2.
14. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
15. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
16. Faucets: ASME A112.18.1.
17. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
18. Hose-Coupling Threads: ASME B1.20.7.
19. Manual-Control Antiscald Faucets: ASTM F 444.
20. Pipe Threads: ASME B1.20.1.
21. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
22. Atmospheric Vacuum Breakers: ASSE 1001.
23. Brass and Copper Supplies: ASME A112.18.1.
24. Manual-Operation Flushometers: ASSE 1037.
25. Plastic Tubular Fittings: ASTM F 409.
26. Brass Waste Fittings: ASME A112.18.2.
27. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
28. Flexible Water Connectors: ASME A112.18.6.
29. Floor Drains: ASME A112.6.3.
30. Grab Bars: ASTM F 446.
31. Hose-Coupling Threads: ASME B1.20.7.

32. Off-Floor Fixture Supports: ASME A112.6.1M.

33. Pipe Threads: ASME B1.20.1.

1.7 COORDINATION

A. Coordinate all accessories. Ensure items fit and work together as an assembly. Provide additional accessories to accommodate final installed field conditions; to include, but not limited to, offsets and other items required for ADA compliance. Provide necessary accessories and components for complete installation.

B. Coordinate roughing-in, final plumbing fixture locations, and verify that fixtures can be installed to comply with design.

C. Model numbers are intended to identify families of fixtures and may be incomplete. Refer to other contract documents for hand.

D. Where fixtures or its associated components are installed in rated floors, walls, or ceilings; provide rated fixtures, accessories, and components of equal rating.

PART 2 - PRODUCTS

2.1 FASTENERS

A. All exposed fasteners shall be security fasteners.

2.2 (PLA-1) SECURITY LAVATORY (ACCESSIBLE)

A. Basis-of-Design: Willoughby model HS-1014-96-HC

1. Description: Mounted on finished wall serviceable from an accessible pipe chase, fabricated from stainless steel.

a. Lavatory:

1) Comply with ANSI/UFAS/ADA for accessibility.

2) Provide off floor wall mounted wall outlet installation.

3) Provide 14 gauge type 304 stainless steel construction

4) Provide fire retardant sound deadening on non-visible surfaces.

5) Provide rectangular bowl.

6) Provide lavatory overflow

7) Provide removable P-Trap

8) Provide wall sleeve or metal template providing all openings and mounting points required by fixture.

9) Provide sealed no voids or crevices where contraband can be concealed.

10) Provide ligature resistant pneumatic pushbuttons for hot and cold valve operation.

11) Provide accessible pneumatic pushbuttons requiring less than 5 pounds to operate.

b. Joint Sealant:

1) Place security (Dynaflex or equal, slightly flexible) caulk around the entire fixture interface as it touches either the floor or wall.

c. Fasteners:

1) Provide fasteners for proper installation.

2. Lavatory supply panel:

a. Dual temp pneumatic metering valve panel.

1) Provide penal lavatory valve of same manufacturer as lavatory.

2) Provide air controlled valve.

3) Provide hot and cold metering valve.

4) Provide non-hold open operation.

5) Provide 0.5 GPM flow control.

6) Provide valve conforming to lead free requirements of NSF-61

3. Joint Sealant:

a. Place security (Dynaflex or equal, slightly flexible) caulk around the entire fixture interface as it touches either the floor or wall.

4. Other manufacturers:

a. Lavatory:

1) Acorn
2) Metcraft

b. Valve:

1) Acorn

2) Metcraft

2.3 (PWC-1) STAINLESS STEEL SECURITY TOILET (ACCESSIBLE)

A. Basis of Design: Willoughby series ASETW-1490-FM (1.6 gallons per flush)

1. Description: Ligature resistant toilet. Floor mounted, wall outlet, fabricated of stainless steel.
2. Toilet Type: Blowout jet
3. Color: NA
4. Toilet Seat: Integral
5. Mounting: On-floor
6. Outlet: Wall

B. General : ADA compliant, on floor, wall outlet, rear spud with integral seat. Comply with ANSI/ASME A112.19.3 for water closet component.

C. Flush Valve: Willoughby/Sloan Model (1.6 Gal. Flush)

1. Body material:

a. Semi-red brass containing no more than 15% zinc.

b. Alloy #857 Yellow brass with DR Inhibitor providing an average depth of dezincification less than 75 (um) when tested in accordance with Australian Standard #2435. Provide independent test results.

c. Supply Rough-in Elevation: 22½" above centerline of spud connection

d. Warranty: Manufacturer's standard warranty with an additional 10 year warranty against dezincification in all water conditions. This warranty shall be non-prorated, shall include labor and material, and shall be provided in writing from the manufacturer.

e. Provide the following flush valve accessories:

1) ADA compliant, accessible, non hold open push button.
2) Sweat Solder Adapter.

D. Provide the Following Fixture Accessories:

1. Wall outlet
2. Wall sleeve
3. Ligature resistant pneumatic push buttons
4. Toilet overflow preventer with auto reset

5. Toilet waste extension
6. Toilet waste coupling
7. Pinned cleanout.
8. Toilet Shipping cover

E. Installation: Install fixture in accordance with fixture or cell manufacturer's recommendations.

F. Joint Sealant:

1. Place security (Dynaflex or equal, slightly flexible) caulk around the entire fixture interface as it touches either the floor or wall.

G. Other Manufacturers:

1. Flush Valve:

a. Sloan

b. Willoughby

2. Fixture:

a. Acorn

b. Metcraft

2.4 SECURITY FASTENERS

A. Refer to section Common Work Results for Plumbing Piping.

PART 3 - EXECUTION

3.1 JOINT SEALANT

A. All fixtures require joint sealant.

B. Identify and coordinate the filling of all interfaces, under the Contract, between all fixtures, equipment, embeds and other physical items and building components. Refer to specification Section Joint Sealants and its article on "SECURITY SEALANTS" for the types of sealants to be utilized, e.g. Elastomeric Security Sealant similar to Dynaflex , by Pecora Corp and Low-Mod Gel Security Sealant similar to Dynapoxy EP-1200, by Pecora Corp.

C. Fill all interfaces between fixtures and building components creating a minimum ¼" bead. Bead shall be neat and workman like in appearance as judged by the architect's representative.

3.2 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Manufacturer's roughing-in data overrides all other indicated data.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.

C. Install back-outlet, wall hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounted fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball valve if stops are not specified with fixture. Refer to Section "Valves".

J. Install trap and waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N. Install toilet seats on water closets.

O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install water supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

Q. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

R. Install shower, flow-control fittings with specified maximum flow rates in shower arms.

S. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

T. Install disposer in outlet of sinks indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

U. Install hot-water dispensers in back top surface of sink or in counter with spout over sink.

V. Install escutcheons at piping wall-ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 22 Section “Common Work Results For Plumbing" for escutcheons.

W. Refer to Section "Joint Sealants" for sealant and installation requirements.

X. Provide connection to automatic lavatories & flush valves as required via low-voltage transformer(s). Mount transformer(s) above accessible ceiling. Connect to local 120V receptacle circuit with disconnect switch adjacent to transformer. All circuitry (including low voltage) shall be run concealed & in conduit. Coordinate connection requirements.

3.4 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water supplies from water distribution piping to fixtures.

C. Connect drain piping from fixtures to drainage piping.

D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use sizes required to match fixtures. Connect to plumbing piping.

E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

F. Ground equipment: Tighten electrical connectors and terminals according to manufacturer's

published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.6 ADJUSTING

A. Replace washers and seals or cartridges of leaking and dripping faucets, stops, and valves.

3.7 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.8 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 QUALITY ASSURANCE

A. Equipment and appliances comprising portions of the mechanical systems regulated by the applicable building codes shall be listed and labeled in accordance with the current edition of those codes.

B. Equipment and appliances comprising portions of the mechanical systems shall be installed in accordance with the listing, manufacturer's installation instructions, and the applicable building codes. Manufacturer's installation instructions shall be available on the job site for use and inspection.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.3 INTENT OF CONTRACT DOCUMENTS

A. Mechanical and HVAC drawings are diagrammatic, indicating general locations and arrangements of pipe, duct, and equipment. Not necessarily indicating all offsets, conditions, and appurtenances required to provide clearances for maximum practical accessibility to perform maintenance.

B. Coordinate work in order to achieve proper operation and to provide a maintainable installed condition.

C. Notify the Architect's representative immediately of conditions which do not comply or will not produce this result.

D. Indicated configurations were used to size pipes, pumps, expansion tanks and other devices. Install piping, duct, and equipment generally as indicated. Minor deviations are permitted in the course of necessary coordination. Major changes shall be submitted for approval by the Architect's representative. Additional fittings and offsets not indicated are expected, anticipated by the design, and shall be provided. If more than 5% of the indicated number of fittings are required or if one change in direction is within six inches of another change in direction and this "Z" shape is not indicated notify the Architect's representative immediately. Provide necessary additional fittings and offsets. Changes in pipe size shall be made only with written approval from the Architect's representative.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 HVAC DEMOLITION

A. Refer to Sections "Cutting and Patching" and "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Remove equipment and associated piping back to main unless otherwise indicated. Cap services.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services. Remove, clean, and store equipment. When appropriate, reinstall, reconnect, and make equipment operational.
5. Equipment to Be Removed and Salvaged: Remove equipment and associated piping back to main unless otherwise indicated. Cap services. Remove equipment, clean, and store as directed (May be off-site). Make available to owner at time of the owner's choosing.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb and parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to service side of equipment.

D. Install equipment to allow space for other systems.

3.3 PAINTING

A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.4 HOUSEKEEPING PADS AND EQUIPMENT PADS

A. Housekeeping pads and equipment pads: Anchor equipment to concrete according to equipment manufacturer's written instructions and according to seismic codes at project location.

1. Construct concrete pads in accordance with drawing details.
2. Details may be found on structural drawings. If details are not provided comply with the following:
    a. Housekeeping pads inside the building shall be 6" thick and 6" larger all around than supported equipment. Provide #4 rebar at 12" on center each way at mid-depth of slab. Provide a 3/4" chamfer on all edges.
    b. Equipment pads outside the building shall be 8" thick with a 12" deep and 20" wide turndown (footing) all around the outside edge of the pad. Provide #5 rebar at 16" on center each way at mid-depth of slab. Pad shall be 6" larger all around than supported equipment.
    c. Install dowel rods to connect housekeeping pad to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the pad. Provide a 1" chamfer on all edges.
    d. Install epoxy-coated anchor bolts. For equipment on housekeeping pads bolts shall extend through housekeeping pad, and anchor into structural concrete floor.
    e. Place and secure anchor bolts using supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions for placement.
    f. Install anchor bolts to elevations required for proper attachment to supported equipment.
    g. Install anchor bolts according to anchor bolt manufacturer's written instructions.
    h. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section "Cast-in-Place Concrete."

END OF SECTION 230500

SECTION 230513 – MOTORS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Manufacturer's catalog and efficiency data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 COORDINATION

A. All motors are required to be equipped with overload protection located near the motor.

1. Overload protection shall:

   a. Be located between the circuit breaker or fuse provided under Division 26 and the motor windings.
   b. Meet one of the options specified in the following paragraph.

2. Overload protection may be:

   a. Located in the motor installed by the motor manufacturer. (preferred)
   b. A separate device located near the motor.
   c. Located in, or with, a disconnect switch provided by the equipment manufacturer. Provision of this switch shall not modify, change, or eliminate any Division 26 requirement. This means some equipment shall be provided or specified with two disconnecting means.

B. Coordinate features of motors, installed units, and accessory devices. Provide motors that are:

1. Compatible with controller
2. Matched to torque and horsepower requirements of the load.
3. Matched to ratings and characteristics of supply circuit and required control sequence.

C. Coordinate motor support with requirements for driven load; access for maintenance and motor replacement; installation of accessories, belts, belt guards; and adjustment of sliding rails for belt tensioning.

D. Belt tension must be wrench and socket adjustable.

E. Belt tensioning device must accommodate adjustable sheaves.

PART 2 - PRODUCTS

2.1 MOTOR REQUIREMENTS

A. Motor requirements apply except as follows:

1. Ratings, performance, or characteristics for a motor are specified in another Section or are scheduled on the drawings.

2. Motor manufacturer requires ratings, performance, or characteristics, other than those specified to meet indicated performance.

2.2 MOTOR CHARACTERISTICS

A. Frequency Rating: 60 Hz.

B. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.

C. Duty: Continuous at 105 deg F and 3300 feet above sea level.

D. Capacity and Torque sufficient to:

1. Start, accelerate, and operate connected load.

2. Maintain designated speeds.

3. Operate at installed altitude and environment.

4. Operate with indicated operating sequence.

5. Operate without exceeding nameplate ratings.

6. Operate without utilizing service factor.

E. Enclosure: Open drip-proof unless otherwise indicated.

F. Minimum Service Factor: 1.15 unless otherwise indicated.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. NEMA Premium efficiency motors shall meet the following full load efficiency:

Motor Horsepower (HP)	Nominal Full-Load Efficiency (%)							
	2-Pole		4-Pole		6-Pole		8-Pole	
	Enclosed	Open	Enclosed	Open	Enclosed	Open	Enclosed	Open
1	77	77	85.5	85.5	82.5	82.5	75.5	75.5
1.5	84	84	86.5	86.5	87.5	86.5	78.5	77
2	85.5	85.5	86.5	86.5	88.5	87.5	84	86.5
3	86.5	85.5	89.5	89.5	89.5	88.5	85.5	87.5
5	88.5	86.5	89.5	89.5	89.5	89.5	86.5	88.5
7.5	89.5	88.5	91.7	91	91	90.2	86.5	89.5
10	90.2	89.5	91.7	91.7	91	91.7	89.5	90.2

15	91	90.2	92.4	93	91.7	91.7	89.5	90.2
20	91	91	93	93	91.7	92.4	90.2	91
25	91.7	91.7	93.6	93.6	93	93	90.2	91
30	91.7	91.7	93.6	94.1	93	93.6	91.7	91.7
40	92.4	92.4	94.1	94.1	94.1	94.1	91.7	91.7
50	93	93	94.5	94.5	94.1	94.1	92.4	92.4
60	93.6	93.6	95	95	94.5	94.5	92.4	93
75	93.6	93.6	95.4	95	94.5	94.5	93.6	94.1
100	94.1	93.6	95.4	95.4	95	95	93.6	94.1
125	95	94.1	95.4	95.4	95	95	94.1	94.1
150	95	94.1	95.8	95.8	95.8	95.4	94.1	94.1

C. Efficiency: NEMA Premium

D. Stator: Copper windings, unless otherwise indicated.

E. Rotor: Squirrel cage, unless otherwise indicated.

F. Bearings: Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating, unless otherwise indicated.

H. Insulation: Class F, unless otherwise indicated.

I. Code Letter Designation: NEMA starting Code F or G.

J. Enclosure: Cast iron.

K. Finish: Gray enamel.

L. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

M. Motors Used with Variable Speed Drives: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

2. Premium Efficiency Motors: Class B temperature rise, Class F insulation.

3. Inverter-Duty Motors: Class F temperature rise, Class H insulation.

4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally-protected motors.

5. Shaft Grounding: Provide AEGIS bearing protection ring or approved equal.

a. All motors operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge electrical shaft currents within the motor and/or its bearings.

b. Motors up to 100 HP shall be provided with a minimum of one shaft grounding ring installed either on the drive end or non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor.
c. Grounding rings shall be provided and installed by the motor manufacturer in accordance with the shaft grounding ring manufacturer's recommendations.

N. Source Quality Control: Perform the following tests on each motor according to NEMA MG 1:

1. Measure winding resistance.
2. Read no-load current and speed at rated voltage and frequency.
3. Measure locked rotor current at rated frequency.
4. Perform high-potential test.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Perform the following:

1. Run each motor with its controller at load.
2. Demonstrate correct rotation, alignment, and speed.
3. Test interlocks and control features for proper operation.
4. Verify that current in each phase is within nameplate rating.
5. Verify RPM is in accordance with nameplate.
6. Where a generator is provided, run each motor on the generator with its controller and load. Demonstrate correct rotation, alignment, and speed.

3.2 ADJUSTING

A. Align motors, bases, and shafts.

3.3 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

END OF SECTION 230513

SECTION 230514 – VARIABLE SPEED DRIVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Factory Installed Variable Speed Drive: A drive installed by motorized-equipment manufacturer as a component of equipment utilized to control the speed of a motor.

B. Field-Installed Variable Speed Drive: A drive installed in the field by the contractor to control the speed of a motor not equipped with a factory installed drive.

C. VSD: Variable Speed Drive

1.3 SUBMITTALS

A. Submittals shall include the following information:

1. Outline dimensions
2. Conduit entry locations
3. Weight.

B. Customer connection and power wiring diagrams.

C. Technical product description including but not limited to a complete list of options.

D. The VFD manufacturer shall provide calculations; specific to this installation, showing total harmonic voltage distortion is less than 5%. All VFDs shall include a minimum of 5% impedance reactors.

E. All VFDs shall include a minimum of 5% impedance reactors.

1.4 QUALITY ASSURANCE

A. VSDs and options shall be UL listed as a complete assembly.

B. The base VSD shall be UL listed for 100 KAIC without the need for input fuses.

C. The VSD shall be tested by the manufacturer.

D. All optional features shall be functionally tested at the factory for proper operation.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use. Comply with UL 508C.

F. Referenced standards:

1. Standard 519, IEEE Guide for Harmonic Content and Control, latest edition.
2. UL508C
3. ICS 7.0, AC Adjustable Speed Drives
4. IEC 16800 Parts 1, 2 and 3NEC 430.120, Adjustable-Speed Drive Systems
5. IBC (adopted by jurisdiction)– referencing ASC 7 and ICC AC-156

G. All VSDs installed on this project shall be from the same manufacturer.

H. The VSD enclosure shall be seismically certified and labeled in accordance with the IBC 2012 International Building Code:

1. VSD manufacturer shall provide Seismic Certification and Installation requirements at time of submittal.
2. A Seismic importance factor of 1.5 shall be used and shall be based upon actual shake test data as defined by ICC AC-156. Seismic ratings based upon calculations alone are not acceptable.
3. Certification of Seismic rating must be based on testing done in all three axis of motion by a certified lab.

I. Installations in life safety applications including but not limited to smoke removal and make up air to smoke removal systems shall be included in the seismic approval.

1.5 WARRANTY

A. The VSD shall be warranted by the manufacturer for a period of 2 Years from Date of Substantial Completion. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service. The warranty shall be provided by the VSD manufacturer.

1.6 COORDINATION

A. Coordinate features of VSDs with motors, installed units, and accessory devices. Provide VSDs that meet the requirements indicated in this and other equipment specific specification sections.

B. Confirm that motors controlled by VSDs, provided under this section are designed and labeled for use with variable speed drives, and suitable for use throughout speed range without overheating.

C. Coordinate VSD support with requirements for maintenance and replacement; and installation of accessories.

PART 2 - PRODUCTS

2.1 FACTORY INSTALLED VARIABLE SPEED DRIVES

A. The VSD shall be enclosed in a UL Listed enclosure.

B. Refer to equipment specific specification sections.

C. Where equipment specific specification sections do not indicate variable speed drive requirements comply with 2.2 below, however can be manufactured by equipment providers standard drive supplier.

2.2 FIELD-INSTALLED VARIABLE SPEED DRIVES

A. Manufacturers

1. Basis of Design – ABB
2. Yaskawa
3. Danfoss-Graham

B. General

1. Furnish complete variable speed drives (VSDs) as indicated.
2. Drawing schedules, sequences of control, control diagrams, details, or other specification sections may indicate variable speed requirements.
3. All standard and optional features shall be included within the VSD enclosure, unless indicated otherwise. Each VSD shall be housed in a NEMA 1 enclosure, or other NEMA type according to installation and operating conditions.
4. Provide NEMA 3R weatherproof enclosures for drives mounted outside.
5. The UL listing shall allow mounting in a plenum or other air handling compartment. If a NEMA 12 enclosure is required for the plenum rating, the manufacturer shall supply a NEMA 12 rated VSD.
6. A bypass is not required unless indicated otherwise.

C. The VSD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current. Operation shall be suitable for centrifugal pump and fan control and shall eliminate the need for motor de-rating.

D. With the motor's rated voltage applied to the VSD input, the VSD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VSDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.

E. The VSD shall include an input full-wave bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.

F. The VSD and options shall be tested to ANSI/UL Standard 508. The complete VSD, including all specified options, shall be assembled by the manufacturer and shall be UL-508 certified for

the building and drive assembly including options. Assembly of the options by a third-party panel shop is not acceptable. The appropriate UL stickers shall be applied to both the VSD and option panel, in the case where these are not contained in one panel.

G. The VSD shall have DC link reactors on both the positive and negative rails of the DC bus to minimize power line harmonics. VSDs without DC link reactors shall provide a minimum 3% impedance line reactor.

H. The VSD's full load amp rating shall meet or exceed NEC Table 430-150. The VSD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.

I. The VSD shall be able to provide full torque at any selected frequency from 28 Hz to base speed to allow driving direct drive fans without derating.

J. An automatic energy optimization selection feature shall be provided standard in the VSD. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide up to an additional 3% to 10% energy savings.

K. Input and output power circuit switching shall be able to be accomplished without interlocks or damage to the VSD. Switching rate may be up to 1 time per minute on the input and unlimited on the output.

L. An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to run the test.

M. Galvanic and/or optical isolation shall be provided between the VSD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VSDs not including either galvanic or optical isolation on both analog I/O and discrete I/O shall include additional isolation modules.

N. VSD shall minimize the audible motor noise through the use of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VSD efficiencies while reducing motor noise.

O. Protective Features:

1. Disconnect with drive fusing.
2. A minimum of Class 20 I^2t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications shall be provided.
3. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VSD overtemperature and motor overtemperature. The VSD shall display all faults in plain English. Codes are not acceptable.
4. Protect VSD from sustained power or phase loss. The VSD shall provide full rated output with an input voltage as low as 90% of the nominal. The VSD will continue to

operate with reduced output with an input voltage as low as 164 V AC for 208/230 volt units, and 313 V AC for 460 volt units.

5. The VSD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
6. VSD package shall include semi-conductor rated input fuses to protect power components.
7. To prevent breakdown of the motor winding insulation, the VSD shall be designed to comply with IEC Part 34-17. Otherwise, the VSD manufacturer must ensure that inverter rated motors are supplied.
8. VSD shall include a "signal loss detection" circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.
9. VSD shall function normally when the keypad is removed while the VSD is running and continue to follow remote commands. No warnings or alarms shall be issued as a result of removing the keypad.
10. VSD shall catch a rotating motor operating forward or reverse up to full speed.
11. VSD shall be rated for 100,000 amp interrupting capacity (AIC).
12. VSD shall include current sensors on all three output phases to detect and report phase loss to the motor. The VSD will identify which of the output phases is low or lost.
13. VSD shall continue to operate without faulting until input voltage reaches 300 V AC on 208/230 volt VSDs, and 539 V AC on 460 volt VSDs.

P. Interface Features:

1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VSD and determine the speed reference.
2. The VSD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VSD is in Auto/Remote mode.
3. The VSD shall provide potentiometer speed control. Electronic speed controls are not acceptable.
4. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away using standard 9-pin cable.
5. The keypads for all sizes of VSDs shall be identical and interchangeable.
6. To set up multiple VSDs, it shall be possible to upload all setup parameters to the VSD's keypad, place that keypad on all other VSDs in turn and download the setup parameters to each VSD. To facilitate setting up VSDs of various sizes, it shall be possible to download from the keypad only size independent parameters.
7. Display shall be programmable to display in 9 languages including English, Spanish and French.
8. The display shall have four lines, with 20 characters on three lines and eight large characters on one line.
9. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VSD when the keypad is removed.
10. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VSD eliminating the need for macros.
11. The VSD shall include a standard RS-485 communications port.
12. As a minimum, the following points shall be controlled and/or accessible:

    a. VSD Start/Stop

b. Speed reference
c. Fault diagnostics
d. Meter points
e. Motor power in HP
f. Motor power in kW
g. Motor kW-hr
h. Motor current
i. Motor voltage
j. Hours run
k. Feedback signal #1
l. Feedback signal #2
m. DC link voltage
n. Thermal load on motor
o. Thermal load on VSD
p. Heat sink temperature

13. Four additional Form C 230 volt programmable relays shall be available for factory or field installation within the VSD.
14. LonWorks communication shall be available for factory or field installation within the VSD.
15. Two set-point control interface (PID control) shall be standard in the unit. VSD shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.
16. Floating point control interface shall be provided to increase/decrease speed in response to contact closures.
17. Four simultaneous displays shall be available. They shall include frequency or speed, run time, output amps and output power. VSDs unable to show these four displays simultaneously shall provide panel meters.
18. Sleep mode shall be provided to automatically stop the VSD when its speed drops below set "sleep" level for a specified time. The VSD shall automatically restart when the speed command exceeds the set "wake" level.
19. The sleep mode shall be functional in both follower mode and PID mode.
20. Run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VSD does not start until dampers or other auxiliary equipment are in the proper state for VSD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VSD to start.
21. The following displays shall be accessible from the control panel in actual units: Reference Signal Value in actual units, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kW-hr, Output Voltage, DC Bus Voltage, VSD Temperature in degrees, and Motor Speed in engineering units per application (in GPM, CFM, etc.). VSD will read out the selected engineering unit either in a linear, square or cubed relationship to output frequency as appropriate to the unit chosen.
22. The display shall be programmed to read in inches of water column (in-wg) for an air handler application, pressure per square inch (psi) for a pump application, and temperature (^{o}F) for a cooling tower application.
23. VSD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.
24. If the temperature of the VSD's heat sink rises to 80°C, the VSD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VSD shall automatically reduce its output frequency to the

motor. As the VSD's heat sink temperature returns to normal, the VSD shall automatically increase the output frequency to the motor and return the carrier frequency to its normal switching speed.

25. The VSD shall have temperature controlled cooling fans for quiet operation and minimized losses.
26. The VSD shall store in memory the last 10 faults and related operational data.
27. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
28. Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VSD status.
29. Three programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltage (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.
30. Two programmable 0 to 20 mA analog outputs shall be provided for indication of VSD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24 V DC status indication.
31. Under fire mode conditions, the VSD shall be able to be programmed to automatically default to a preset speed.

Q. Adjustments

1. VSD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VSD to the motor.
2. Sixteen preset speeds shall be provided.
3. Four acceleration and four deceleration ramps shall be provided. Acceleration and deceleration times shall be adjustable over the range from 0 to 3,600 seconds to base speed. The shape of these curves shall be automatically contoured to ensure no-trip acceleration and deceleration.
4. Four current limit settings shall be provided.
5. If the VSD trips on one of the following conditions, the VSD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit and inverter overload.
6. The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.
7. An automatic "on delay" may be selected from 0 to 120 seconds.

R. Service Conditions

1. Ambient temperature, -10 to 40°C (14 to 104°F).
2. 0 to 95% relative humidity, non-condensing.
3. Elevation to 3,300 feet without derating.
4. AC line voltage variation, -10 to +10% of nominal with full output.
5. No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Examination

1. Contractor to verify that job site conditions for installation meet factory recommended and code-required conditions for VSD installation prior to start-up, including clearance spacing, temperature, contamination, dust, and moisture of the environment. Separate conduit installation of the motor wiring, power wiring, and control wiring, and installation per the manufacturer's recommendations shall be verified.
2. The VSD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VSD shall not be operated while the unit is covered.

B. Start-up Service

1. The manufacturer shall provide start-up commissioning of the VSD and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. Sales personnel and other agents who are not factory certified shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VSD, its options and its interface wiring to the building automation system.

3.2 CLEANING: After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

END OF SECTION 230514

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

A. Available Manufacturers:

1. Smith, Jay R. Mfg. Co.
2. Wade
3. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Available Manufacturers:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Link Seal
4. Metraflex Company (The).
5. Pipeline Seal and Insulator, Inc.
6. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM or Nitrile rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, non-sag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C920, Type S, Grade NS, Class 25, use NT.

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire-rated.

C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.
    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide ¼" clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants.

E. Fire Ratings: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide ¼" clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Division 07 Section "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire Rating: Maintain indicated fire rating at pipe penetrations. Seal pipe penetrations with firestop materials.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building unless otherwise indicated. They are not required at sanitary and storm piping exits unless otherwise indicated.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade, below Grade, Concrete Slabs-on-Grade, and Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

END OF SECTION 230517

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design Requirement: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer where using methods other than indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test medium.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following and include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

1.5 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

B. Trapeze Pipe Hanger Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

1. Assemble and provide according to manufacturer's written instructions. Center piping on channel to evenly distribute load.

2. Pipe sizes and numbers shall be in accordance with the following:

TRAPEZE PIPE HANGER TABLE								
PIPE SIZE	**4”**	**3”**	**2 ½”**	**2”**	**1 ½”**	**1 ¼”**	**1”**	**TOTAL # of PIPES**

NUMBER OF PIPES PERMITTED IN ONE CHANNEL SUPPORT	**2**	0	0	0	0	0	0	**2**
	0	**2**	**2**	0	0	0	0	**4**
	0	**2**	0	**4**	0	0	0	**6**
	0	**2**	0	0	**6**	0	0	**8**
	0	0	**4**	**2**	0	0	0	**6**
	0	0	**4**	0	**2**	**2**	0	**8**
	0	0	**4**	0	0	**8**	0	**12**
	0	0	0	**6**	**2**	**2**	**2**	**12**
	0	0	0	**8**	0	**2**	0	**10**
	0	0	0	0	**14**	0	0	**14**
	0	0	0	0	0	**16**	0	**16**

Notes:

1. Piping larger than 4" in diameter is not permitted in a channel support system.
2. Channel support systems shall be limited to eight (8) pipes per channel and two (2) channels (levels) per support system.
3. Smaller pipes can be substituted for larger pipes. For example two ¾" pipes may be installed in lieu of two 1" pipes, or 2" in lieu of 3", etc.
4. Spacing shall be in accordance with requirements for the smallest supported pipe. Refer to other specification sections for spacing requirements. If spacing requirements are not indicated comply with MSS SP-69.

C. Metal Framing Systems:

1. Available Manufacturers:
   a. Anvil International; a subsidiary of Mueller Water Products Inc.
   b. Empire Industries, Inc.
   c. ERICO International Corporation.
   d. Haydon Corporation; H-Strut Division.
   e. NIBCO INC.
   f. PHD Manufacturing, Inc.
   g. PHS Industries, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

7. Coating: Zinc.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Available Manufacturers:

1. Buckaroos, Inc.
2. Carpenter & Paterson, Inc.
3. Clement Support Services.
4. ERICO International Corporation.
5. National Pipe Hanger Corporation.
6. PHS Industries, Inc.
7. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
8. Piping Technology & Products, Inc.
9. Rilco Manufacturing Co., Inc.
10. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig, ASTM C 552, Type II cellular glass with 100-psig, or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. Vapor Barrier**:** ASTM C 1136, Type IX, three-ply composite membrane consisting of a 0.5-mil white polyester film, 1.0-milaluminum foil, and one 0.5-milclear polyester film.

E. Insulation Protection Shields: Galvanized metal, G90 coating designation, complying with ASTM A 653/A 653M, 180-degree saddle, centered and adhered to bottom a minimum of 1-1/2 inches jacketed insulation extending from each side to allow for proper circumferential closure at butt joints with 3-inch-wide zero-permeance tape.

F. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

G. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

H. Insert Length: Extend 2" beyond sheet metal shield for piping operating below ambient air temperature.

2.4 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

1. Available Manufacturers:

a. Cooper B-Line – Dura-Blok
b. MAPA Products

c. Mifab, Inc. – C-Port
d. Miro Industries, Inc.
e. OMG, Inc.
f. PHP Systems/Design
g. Pipe Prop
h. Roof Top Blox
i. Rooftop Support Systems – Eberl Iron Works, Inc.

2. Provide pipe supports for supporting gas, condensate, refrigeration lines, or hydronic piping on flat roof surfaces. Support shall rest on roof surface without penetrating the roof surface. Supports for condensate piping shall be adjustable vertically to ensure pipe slopes as required.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Curb Mounted Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.5 EQUIPMENT SUPPORTS/RAILS

A. Description: Welded, shop or field fabricated equipment support made from structural carbon-steel shapes unless indicated otherwise.

1. Available Manufacturers:

a. Curbs Plus, Inc. – CPES-X
b. Kees – Equipment Support Model SF
c. Pate Company – Equipment Support ES-2
d. Portals Plus – ER-2A
e. Roof Products and Systems – Equipment Rails ER-2B
f. Thybar Corporation – TEMS 3

2. Construction:
a. Minimum 18 gauge, G90 galvanized steel. Fully mitered and welded corners. Integral base plate. 3" Cant style support. All welds prime painted after fabrication. Full-depth internal C-channel reinforcing on 12" centers and 6" spreader channels on alternating 12" centers. 18 Gauge counterflashing factory-installed with tek-screws and neoprene washers. Factory-installed 2'x4" pressure-treated wood nailer.
b. Minimum height of 12" above finished roof or as noted.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Provide hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69, MSS SP-89, and Table above. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Provide in pipe hanger or shield for insulated piping.

E. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 Section "Roof Accessories" for curbs.

F. Provide hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Provide hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Provide lateral bracing with pipe hangers and supports to prevent swaying.

J. Provide building attachments within concrete slabs or attach to structural steel. Building attachments may not used on steel joists unless otherwise indicated. Provide additional attachments at concentrated loads, including valves, flanges, and strainers, 2-1/2" and larger and at changes in direction of piping. Provide concrete inserts before concrete is placed; fasten inserts to forms and provide reinforcing bars through openings at top of inserts.

K. Load Distribution: Provide hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Provide hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Provide thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Provide MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

3. Provide MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

4. Shield Dimensions for Pipe: Not less than the following:

   a. Pipe ¼" to 3-½": 12 inches long and 0.048 inch thick.
   b. Pipe 4": 12 inches long and 0.06 inch thick.
   c. Pipe 5" and 6": 18 inches long and 0.06 inch thick.
   d. Pipe 8" to 14": 24 inches long and 0.075 inch thick.

5. Pipes 8" and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Provide with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 ROOF EQUIPMENT SUPPORTS

A. Equipment supports must span a minimum of two structural roof members.

B. No load shall be applied to a cantilever exceeding 12" in length.

C. Fasten base flange to roof steel or deck with stitch weld or mechanical fastener not exceeding 18" on center in accordance with NRCA specifications.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Provide materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup: Unless otherwise indicated clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Provide same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and immediately apply galvanizing-repair paint. Paint shall comply with ASTM A 780.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Provide hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Provide nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Provide copper-plated pipe hangers and copper attachments for copper piping and tubing.

F. Provide padded hangers for piping that is subject to scratching.

G. Provide thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated provide the following:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of stationary pipes ½" to 30".
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes 4" to 14", requiring up to 4" of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes ¾" to 14", requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes ½" to 14" if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes ½" to 4", to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes ¾" to 8".
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes ½" to 8".
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes ½" to 8".
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes ½" to 8".
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes ½" to 8".
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS ½" to 3".
12. U-Bolts (MSS Type 24): For support of heavy pipes ½" to 14".
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes 4" to 14", with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes 4" to 14", with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes 2-½" to 14" if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes 1" to 14", from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes 2-½" to 14", from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes 2" to 14" if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes 2" to 14" if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes 2" to 14"if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

I. Vertical-Piping Clamps: Unless otherwise indicated provide the following:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers ¾" to 14".
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers ¾" to 14" if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated provide the following:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
6. Flat Plate, Double Nut, and Washer as Detailed on Structural Drawings: For attaching to bar joists. Method of attachment to bar joists must be approved by the structural engineer and joist manufacturer.

K. Building Attachments: Unless otherwise indicated provide the following:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Flat Plate, Double Nuts, and Washer as Detailed on Structural Drawings: For use under roof installations with bar-joist construction to attach to bottom chord of joist.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For steel I-beams. Only allowed for open web joists if load does not exceed 50 lbs.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Provide one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
16. For sloping structure, provide clamp with swivel such that required threaded rod is vertical. Bending of threaded rod is not acceptable.

L. Saddles and Shields: Unless otherwise indicated provide the followings:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Unless otherwise indicated provide the following:

1. Restraint-Control Devices (MSS Type 47): To control pipe movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

P. Provide powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where indicated in concrete construction.

END OF SECTION 230529

SECTION 230548 - VIBRATION AND SEISMIC CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning & Development for the State of California.

D. ASCE: American Society of Civil Engineers

1.3 PERFORMANCE REQUIREMENTS

A. Seismic design category: C

1. Provide Seismic installation on all HVAC systems as required by ASCE Standard 7.
2. Building Classification Category (Risk Category, IBC Table 1604.5): IV
3. Seismic Importance Factor (Ie): 1.5

B. Wind-Restraint Loading:

1. Nominal Design Wind Speed (3 second gust): 95 MPH
2. Ultimate Design Wind Speed (3 second gust): 124 MPH
3. Building Classification Category (Risk Category): IV.
4. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is perpendicular to the wind direction, and 45 degrees either side of perpendicular.

C. Component coefficients shall be in accordance with the ASCE 7.

1.4 RESPONSIBILITIES:

A. The manufacturer of vibration isolation and seismic restraint systems and devices shall:

1. Determine the sizes and locations of isolators and seismic restraints.
2. Determine the sizes and location of wind restraints.
3. Provide equipment isolation and seismic restraint indicated.
4. Provide equipment wind restraint indicated.
5. Guarantee indicated isolation system deflections.
6. Provide installation instructions and drawings.
7. Certify correctness of installation upon completion.

B. The Contractor shall cause all vibration isolation systems, including the isolators, seismic restraints/snubbers and flexible connectors between the isolated equipment and associated piping, ducting, and electrical work to be designed by a manufacturer experienced in this type of work.

1.5 SUBMITTALS

A. Product Data:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
4. Seismic and Wind-Restraint Details:
    a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
    b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors.

B. Coordination Drawings: For areas indicated at ¼" = 1'0" and where sections are cut on contract drawings, indicate coordination of seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, include other supports and seismic restraints.

C. Qualification Data: For testing agency.

D. Shop Drawings:

1. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
2. Dimensioned Outline Drawings for Each Scheduled Piece of Equipment: Identify center of gravity.
3. Dimensioned Outline Drawings for Each Scheduled Piece of Equipment: Locate and describe mounting and anchorage provisions.

E. Manufacturer Seismic Qualification Certification: Submit certification that all specified equipment will withstand seismic forces identified in "Performance Requirements" Article above. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.

2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

D. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers:

1. Amber/Booth Company, Inc.
2. B-Line Systems, Inc.
3. Kinetics Noise Control.
4. Mason Industries.
5. Vibration Mountings & Controls, Inc.
6. Vibro-Acoustics, Inc.

B. Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.
2. Durometer Rating: Minimum 30.
3. Number of Layers: 1 2 3 or 4.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Durometer Rating: Minimum 30.

2. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
3. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Restrained Mounts: All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

E. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to ¼" thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

F. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to ¼" thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

G. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of ¼" travel up or down before contacting a resilient collar.

H. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

I. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

J. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

K. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop. Include rod and angle-iron brackets for attaching to equipment.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.

7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

L. Pipe Riser Resilient Support : All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

M. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers:

1. Amber/Booth Company, Inc.
2. Cooper B-Line, Inc.; a division of Cooper Industries.
3. Hilti, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Unistrut; Tyco International, Ltd.
7. Vibro-Acoustics, Inc.

B. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum ¼" air gap, and minimum ¼" thick resilient cushion.

D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

E. Restraint Cables: ASTM A 603 galvanized steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

F. Hanger Rod Stiffener: Provide for affected systems steel tube, steel slotted-support-system sleeve with internally bolted connections, or reinforcing steel angle clamped to hanger rod.

G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

J. Mechanical Anchor Bolts for nonisolated equipment in up to 10 hp: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

K. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic and wind control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic- and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry seismic loads within loading limits.

3.3 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements indicated in the Contract Documents, in codes and ordinances, by Authority Having Jurisdiction, and by Manufacturer, for installation of all devices.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Perform tests.

B. Tests:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Prepare test reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.7 VIBRATION ISOLATION SCHEDULE

A. Piping and Conduit

1. All piping and conduit connected to pumps, air handling units, or other pieces of moving equipment which are isolated from the structure by spring type vibration isolators shall be isolated from these units by flexible pipe connectors and shall be suspended on isolation hangers to a point 20 feet away. Refer to Section "Hydronic Piping" for flexible pipe connectors.
2. Provide spring hangers with 1/2" deflection for suspended piping.
3. Provide spring isolators with 1/2" deflection for floor-mounted piping.

B. Ductwork

1. Flexible connectors shall be used for ductwork connections to air handling units. Refer to Section "Metal Duct Accessories." Ductwork shall be suspended with elastomeric hangers for a distance of 20 feet from air handling units.

C. Packaged Air Handling Units

1. Provide duct connections with flexible duct connectors and pipe connections with flexible piping.

D. Power Ventilators

1. Provide elastomeric hangers for units suspended from structure above ceiling.

E. Condensing Units

1. Provide elastomeric neoprene isolator pad with 1/4" deflection located on equipment curb.

F. Fan-Powered Terminal Units

1. Provide elastomeric hangers for units suspended from structure.

G. Electric Unit Heaters

1. Provide elastomeric hangers for units suspended from structure.

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Valve tags.
6. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:
   a. Manufacturer, product name, model number, and serial number.
   b. Capacity, operating and power characteristics, and essential data.
   c. Labels of tested compliances.

2. Location: Accessible and visible.
3. Fasteners: As required to mount on equipment.

B. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch, stainless steel 0.025-inch, aluminum 0.032-inch, or anodized aluminum 0.032-inch minimum thickness with predrilled or stamped holes for attachment hardware.
2. Letter Color: White or black.
3. Background Color: Black or white.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick with predrilled holes for attachment hardware.
2. Letter Color: White or black.
3. Background Color: Black or white.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

D. Access Panel and Door Markers: 1/16-inch-thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification.

1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

E. Label Content: Include equipment's drawing designation (tag) with unique equipment number as scheduled.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White or black.

C. Background Color: Black or white.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include equipment's drawing designation (tag) with unique equipment number as scheduled. Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

B. Pretensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

3. Refrigerant piping labels shall also include the following on labels in addition to requirements above:

    a. Group A2L and B2L refrigerant piping shall include: "WARNING – A2L - Flammable Refrigerant." Labels shall be applied at 20 foot intervals, at each change in direction, and on both sides of penetrations. Label shall identify refrigerant type, refrigerant classification, and direction of flow. Provide black lettering on yellow background.

2.4 DUCT LABELS

A. Material and Thickness: Self-adhesive duct labels with 2.5-mil clear laminate coating that is UV, chemical, abrasion, and moisture resistant. Provide UV-stable ink suitable for indoor or outdoor use. Colors shall conform to ANSI Z535.1.

B. Letter Color: White.

C. Background Color: Green.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

H. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

    1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

2.5 WARNING TAGS

A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

    1. Size: 3 by 5-1/4 inches minimum.
    2. Fasteners: Reinforced grommet and wire or string.
    3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
    4. Color: Safety-yellow background with black lettering.

2.6 ACOUSTICAL CEILING GRID MARKER

A. General: Plastic tape a minimum of three one-thousandths of an inch thick (3.0 mils) with pressure-sensitive, permanent-type, self-adhesive back.

B. Width: three quarters of an inch (3/4") or 22 millimeters.

C. Letter Size: ¼" minimum or 8 millimeters.

D. Letter Color: Black

E. Tape Color: White.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Section 099100 "Interior Painting."

B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings, omit intermediately spaced labels.

C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

D. Pipe Label Color Schedule:
1. Condenser-Water Piping: White letters on a safety-green background.

3.5 DUCT LABEL INSTALLATION

A. Install duct markers with permanent adhesive on air ducts in colors complying with ASME A13.1.

B. Install plastic-laminated or self-adhesive duct labels with permanent adhesive on air ducts.

C. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 ACOUSTICAL CEILING GRID MARKER INSTALLATION

A. Attach tape with indicated text to t-bar below item of equipment.

B. Attach tape to grid.

C. Prepare surface and attach tape in accordance with manufacturer' recommendations.

D. Surfaces to receive tape shall be clean and free of scale, dirt, and grease.

E. Center tape on support grid. Tape shall be visible from within space.

F. Provide with lettering at equipment located above lay-in tile ceilings including but not limited to:
1. Valves: Text = V
2. Air Handling Units: Text = AHU
3. Air Removal Devices: Text = ARD
4. Strainers: Text = S
5. Terminal Units (VAV boxes): Text = TU
6. Fan Coil Units: Text = FCU
7. Blower Coils: Text = BC

8. Coils: Text = C
9. Heat Pumps: Text = HP
10. Cabinet Unit Heaters: Text = CUH
11. Fans: Text = F
12. Damper operators: Text = D

3.7 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.8 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.9 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.10 CLEANING

A. Clean faces of mechanical identification devices.

END OF SECTION 230553

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Outdoor duct and pipe: Duct conveying untreated outside air at ambient temperature and humidity.

B. Outdoor pipe: Pipe located outside the building insulation envelope.

C. Supply air duct: Duct conveying air on the discharge side of an air handling unit or fan which will be delivered to a space in a building through a diffuser or connection to the return duct of another unit. Ductwork on the discharge side of a 100% outside air unit is considered to be Supply air duct.

D. Return air duct: Duct conveying air from a space or plenum that will return to an air handling unit or energy transfer device. The air may be returned to the supply air duct after being conditioned, or it may be exhausted after passing through an energy transfer device. Typical examples of an energy transfer devices are plate heat exchangers, runaround coils, heat pipes, and energy wheels.

E. Exhaust air duct: Duct conveying air from a space or plenum that will be exhausted from the building without being passed through an energy transfer device.

F. Plenum: An unoccupied space or void, on the conditioned side of the building insulation and vapor barrier, being used to return conditioned air to the inlet side of a return or exhaust fan either directly or via a duct connection. An example would be a space with air handling light fixtures or openings in the ceiling used to transport air through the ceiling and then to an open duct located above the ceiling in another location.

G. Indirectly Conditioned Space: A space having no direct conditioning but, due to air movement induced by an exhaust, or return opening, is conditioned by makeup air from an adjacent space. An example would be a small toilet. Boiler rooms, fan rooms, and mechanical rooms do not qualify as indirectly conditioned spaces.

H. Inside the Building Insulation Envelope: For the purposes of this section, boiler rooms, fan rooms, and mechanical rooms are considered to be OUTSIDE the building insulation envelope.

I. Exposed, Finished Space: A regularly occupied space with no ceiling where piping and ductwork is exposed to occupants and typically requires painted insulation such as gyms, auditoriums, and cafeterias. Rough, not regularly occupied spaces like mechanical rooms, janitor closets, electrical rooms, and receiving areas shall not be considered exposed, finished spaces. Refer to drawings for additional guidance.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Detail application of removable insulation covers.
2. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
3. Detail attachment and covering of heat tracing inside insulation.
4. Detail insulation application at pipe expansion joints for each type of insulation.
5. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
6. Detail removable insulation at piping specialties, equipment connections, and access panels.
7. Detail application of field-applied jackets.
8. Detail application at linkages of control devices.
9. Detail field application for each equipment type.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with type, grade, and maximum use temperature.

B. Ship Insulated Piping System Components on pallets and wood supports. Securely fasten and protect from damage. Store off the ground and cover with opaque waterproof tarp to protect materials from sunlight and rain.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation, duct Installer for duct insulation, and equipment Installer for equipment insulation.

C. Maintain clearances required for maintenance.

D. Coordinate installation and testing of heat tracing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers:

1. Mineral-Fiber Insulation:
   a. CertainTeed Corporation.
   b. Johns Manville.
   c. Knauf Insulation.
   d. Owens Corning.

2. Flexible Elastomeric Thermal Insulation:
   a. Aeroflex USA, Inc.
   b. Armacell, LLC.
   c. K-Flex USA.

3. Removable Insulation Covers:
   a. Advance Thermal Corp.

B. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

E. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

F. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

G. Duct Liner: Refer to specification section "Metal Ducts"

H. Mineral-Fiber Board: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, with factory applied FSK Jacket. Meet the requirements of ASTM C 1290, Type III, inorganic glass fibers bonded by a thermosetting resin to maximum service temperature of 250°F.. Faced insulation shall not exceed 25 Flame Spread, 50 Smoke Developed when tested in accordance with ASTM E84.

I. Semi-Rigid Mineral-Fiber Board: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 1136, Type I, II, III, & IV with factory applied all-service jacket (ASJ) or Type II, IV with factory applied Foil Scrim Kraft (FSK) jacket.

J. Mineral-Fiber Blanket with Factory Applied FSK Jacket: Meet the requirements of ASTM C 1290, Type III, inorganic glass fibers bonded by a thermosetting resin with a multi-purpose foil-scrim kraft (FSK) jacket to maximum service temperature of 250°F. FSK shall meet the requirements of ASTM C 1136, Type II, when surface burning characteristics are determined in accordance with ASTM E 84 with the foil surface of the material exposed to the flame as it is in the final composite. Composite (insulation, facing and adhesive) shall not exceed 25 Flame Spread, 50 Smoke Developed when tested in accordance with ASTM E 84. Insulation properties shall be as follows:

1. Thickness: 1-1/2"
   a. Density: 0.75 pcf
   b. Minimum uncompressed R value: 5.1
   c. Minimum installed R value assuming 25% compression: 4.2

2. Thickness: 2"

a. Density: 1.0 pcf
b. Minimum uncompressed R value: 7.4
c. Minimum installed R value assuming 25% compression: 6.0

3. Alternate to 2" 1.0 pcf: Thickness: 2.2"
   a. Density: 0.75 pcf
   b. Minimum uncompressed R value: 7.4
   c. Minimum installed R value assuming 25% compression: 6.0

4. Thickness: 3"
   a. Density: 0.75 pcf
   b. Minimum uncompressed R value: 10.2
   c. Minimum installed R value assuming 25% compression: 8.3

K. Mineral-Fiber Pipe Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
2. Semi-Rigid Mineral-Fiber Board: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 1136, Type I, II, III, IV with factory applied all-service jacket (ASJ) or Type II, IV with factory applied Foil Scrim Kraft (FSK) jacket.
3. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
4. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
   a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
   b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
5. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
6. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
7. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
8. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

L. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Adhesive: As recommended by insulation material manufacturer.
2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

M. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.2 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Glass Cloth: Woven glass-fiber fabric, plain weave, minimum 8 ounces per square yard.

C. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

D. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.
2. PVC Duct Jacket Color: White or gray.
3. PVC Pipe Jacket Color: Color-code piping jackets based on materials contained within the piping system.

E. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B 209, and having an integrally bonded moisture barrier over entire surface in contact with insulation. Factory cut and rolled to indicated sizes. Comply with ASTM B 209, 3003 alloy, H-14 temper.

1. Finish and Thickness: Stucco-embossed finish, 0.016 inch thick.
2. Moisture Barrier: 1-mil- thick, heat-bonded polyethylene and kraft paper.
3. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

F. Stainless-Steel Jacket: Deep corrugated sheets of stainless steel complying with ASTM A 666, Type 304 or 316; 0.10 inch thick; and roll stock ready for shop or field cutting and forming to indicated sizes.

1. Moisture Barrier: 1-mil- thick, heat-bonded polyethylene and kraft paper.
2. Elbows: Gore type, for 45- and 90-degree elbows in same material, finish, and thickness as jacket.
3. Jacket Bands: Stainless steel, Type 304, 3/4 inch wide.

G. Heavy PVC Pipe Fitting Covers: Factory-fabricated fitting covers manufactured from 30-mil-thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

H. Standard PVC Pipe Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

2.3 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd..

1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
2. Galvanized Steel: 0.005 inch thick.
3. Aluminum: 0.007 inch thick.
4. Brass: 0.010 inch thick.
5. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

D. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.

1. Welded Pin Holding Capacity: 100 lb for direct pull perpendicular to the attached surface.

E. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct, pipe, plenum and breeching with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, pipes, plenums, and breechings; and to achieve a holding capacity of 100 lb. for direct pull perpendicular to the adhered surface.

F. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct, pipe, and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

G. Pipe Attachments for Flexible Elastomeric Insulation: Provide pipe support with high compressive strength material insert imbedded in closed-cell elastomeric foam to prevent condensation and insulation damage at support points. Provide friction insulation tape for connection of pipe insulation to pipe support system.

1. Manufacturers:
   a. Aeroflex – Aerofix
   b. Armacell – Armafix Ecolight
   c. Cooper B-Line, Inc. / Eaton – Armafix
   d. K-Flex USA – K-Flex 360 Pipe Support
   e. ZSi-Foster – Cush-A-Therm

2.4 VAPOR RETARDERS

A. Mastics: Materials that are compatible with insulation materials, jackets, and substrates.

2.5 REMOVABLE INSULATION COVERS

A. Pre-manufactured easily removable insulation cover/blanket intended for insulation of equipment and devices requiring periodic maintenance.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts, piping, and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thickness required for each system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

G. Keep insulation materials dry at all times. Insulation that becomes wet or is otherwise damaged beyond repair, shall be removed immediately and replaced. Replacement material and installation shall be in accordance with these specifications.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the minimum number of joints practical.

J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

K. Refer to special instructions for applying insulation over fittings, valves, and specialties.

L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

M. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

N. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Joints and Seams: Cover with tape and vapor retarder to maintain vapor seal.

3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges, pipe joints, and fittings.

O. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

P. Install vapor-retarder mastic on ducts, pipes, plenums, and equipment.

1. Ducts, pipes, plenums, and equipment with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape and mastic to maintain vapor-retarder seal.
2. Ducts, pipes, plenums, and equipment without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

Q. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Seal insulation to roof flashing with vapor-retarder mastic.

R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

S. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

T. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts, Pipes, and Plenums: Secure blanket insulation with adhesive, and anchor pins with speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct, pipe, and plenum surfaces.
2. Apply adhesive to entire circumference of ducts & pipes and to all surfaces of fittings and transitions. Adhesive may be omitted from the top of horizontal rectangular ducts.
3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
    c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not compress insulation to less than 75% of its original thickness during installation.

4. Install anchor pins and speed washers on sides, top, and bottom of horizontal pipes.
5. Impale insulation over anchors and attach speed washers.
6. Cut excess portion of pins extending beyond speed washers. Cover exposed pins and washers with tape matching insulation facing.
7. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1-inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
8. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches o.c.
9. Apply insulation on rectangular duct elbows, pipe fittings, and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows, and pipe elbows, with individually mitered gores cut to fit the elbow.
10. Insulate duct and pipe stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material as insulation. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
11. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

B. Board Applications for Ducts, Plenums, & Equipment: Secure board insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct, plenum, & equipment surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings, transitions, and equipment. Adhesive may be omitted from top surface of horizontal rectangular ducts.
3. Space anchor pins as follows:
   a. On duct & equipment sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct & equipment sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at bracing.
   c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
   d. Do not compress insulation to less than 75% of its original thickness during installation.
4. Cut excess portion of pins extending beyond speed washers. Cover exposed pins and washers with tape matching insulation facing.
5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1-inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct and equipment stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6" wide strips of the insulating materia. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.

8. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to ducts, plenums, and equipment as follows:

1. Follow the manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the duct, plenum, and equipment surface.

3.6 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

3.7 FINISHES

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 9 Section "Paints."

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color shall be as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.8 DIFFUSER APPLICATIONS

A. Insulate exposed metal surfaces on top of all supply diffusers. Where diffusers are mounted in a metal pan insulate the top of the metal pan.

1. Material: Mineral-Fiber Blanket Thermal Insulation with Factory Applied FSK Jacket.
2. Thickness: 1 inch.
3. Vapor Retarder Required: Yes.

3.9 APPLICATIONS

A. Insulation materials and thickness are specified at the end of this Section.

B. Insulate all ductwork, pipe and equipment:

1. Insulate ductwork in accordance with the application schedule(s) below.
2. Exceptions: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   a. Vibration-control devices.
   b. Testing agency labels and stamps.
   c. Nameplates and data plates.
   d. Manholes.
   e. Handholes.

f. Cleanouts.
g. Plastic condensate drain piping.
h. Pipe-mounted condensate sensors.
i. Return ductwork inside the building insulation envelope.
j. Indoor exposed return air ductwork.
k. Exhaust ductwork.
    1) Exception: Duct beginning 18" upstream of backdraft damper and continuing to building envelope insulation.
l. Metal ducts with duct liner.
m. Factory-insulated flexible ducts.
n. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
o. Flexible connectors.
p. Access panels and doors in air-distribution systems.

3.10 INDOOR APPLICATION SCHEDULE

A. Service: Condensate drain piping except plastic.

1. Insulation Material: Mineral fiber preformed pipe insulation.
2. Insulation Thickness: 1"
3. Vapor Retarder Required: Yes.
4. Finish:
    a. Exposed, Finished Spaces: Painted.
    b. Concealed: None.

B. Refrigerant Suction and Hot-Gas Piping/Tubing:

1. Insulation Material and Thickness:
    a. Flexible Elastomeric: 1 inch thick.

C. Service: Unless otherwise indicated provide the following:

1. Concealed Ducts and Plenums:
    a. Material: Mineral-Fiber Blanket.
    b. Thickness: 2 inches.
    c. Vapor Retarder Required: Yes.

2. Ducts and Plenums in Exposed, Finished Spaces:
    a. Material: Mineral-Fiber Board.
    b. Thickness: 1-1/2 inches.
    c. Field-Applied Jacket: Glass cloth.
    d. Vapor Retarder Required: Yes.
    e. Paint: Color as selected by architect. Refer to section "Painting".

D. Service: Round and flat oval, supply-air ducts, concealed and within the building insulation envelope.

1. Material: Mineral-Fiber Blanket Thermal Insulation with Factory Applied FSK Jacket.
2. Thickness: 1-1/2 inches.
3. Vapor Retarder Required: Yes.

E. Service: Rectangular, supply-air ducts, concealed and within the building insulation envelope.

1. Material: Mineral-Fiber Blanket Thermal Insulation with Factory Applied FSK Jacket.
2. Thickness: 1-1/2 inches.

3. Vapor Retarder Required: Yes.

F. Service: Round and flat oval, supply-air ducts, exposed.

1. Refer to section "Metal Ducts"

3.11 OUTDOOR APPLICATION SCHEDULE

A. Insulation shall be applied after heat tracing and temperature sensors are in place and have been tested.

B. Refrigerant Suction and Hot-Gas Piping:

1. Insulation Material and Thickness:
   a. Flexible Elastomeric: 2 inches thick.
2. Finish: Two coats of UV coating or mastic protectant recommended by the insulation manufacturer or outdoor aluminum jacket.

END OF SECTION 230700

SECTION 230900 – BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

B. Controls for the packaged rooftop units will be provided by the HVAC equipment manufacturer. All unit controllers with communicate via BACnet.

C. Related Sections include the following:
   1. Division 23 Section "Sequences of Control" for requirements that relate to this Section.
   2. Division 28 Sections for additional conduit requirements for all electronic safety and security systems specified under Division 28.

D. Work Under Other Sections:
   1. All wells, valves, taps, dampers, flow stations, etc. furnished by the BAS manufacturer shall be installed under Section "Hydronic Piping."
   2. The following shall be provided under Division 23 specifications sections:
      a. 120V power to BAS panels and devices with circuits indicated on the drawings. Refer to "Coordination" paragraph below.
      b. Wiring of power feeds to disconnect switches and starters.
      c. Wiring from disconnect switches and starters to electric motors.
      d. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished under this section of the specifications.

1.3 DEFINITIONS

A. BAS: Building Automation System.

B. DDC: Direct digital control.

C. I/O: Input/output.

D. IT: Information Technology.

E. IS: Information Systems.

F. LAN: Local Area Network.

G. MS/TP: Master-slave/token-passing

H. NAC: Network area controllers.

I. PC: Personal computer.

J. PID: Proportional plus integral plus derivative.

K. PPM: Parts per million.

L. RTD: Resistance temperature detector.

M. WAN: Wide-Area Network

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

    a. Water Temperature: Plus or minus 1 deg F.
    b. Water Flow: Plus or minus 5 percent of full scale.
    c. Water Pressure: Plus or minus 2 percent of full scale.
    d. Space Temperature: Plus or minus 1 deg F.
    e. Ducted Air Temperature: Plus or minus 1 deg F.
    f. Outside Air Temperature: Plus or minus 2 deg F.
    g. Dew Point Temperature: Plus or minus 3 deg F.
    h. Temperature Differential: Plus or minus 0.25 deg F.
    i. Relative Humidity: Plus or minus 5 percent.
    j. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
    k. Airflow (Terminal): Plus or minus 10 percent of full scale.
    l. Air Pressure (Space): Plus or minus 0.01-inch wg.
    m. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
    n. Carbon Dioxide: Plus or minus 50 ppm.

o. Carbon Monoxide: Plus or minus 5 percent of reading.
p. Electrical: Plus or minus 5 percent of reading.

1.5 SYSTEM DESCRIPTION

A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

B. Control system includes interface to the following:
1. Division 28 sections on Electronic Safety and Security Systems. Provide interface outputs for selective annunciation and monitoring (i.e. alarm status).
2. Fire alarm system specified in Division 28 Section "Digital Addressable Fire Alarm."

C. All monitoring and alarms shall be tied into the County's main BAS server.

1.6 WARRANTY

A. Provide all services, materials and equipment necessary for the successful operation of the entire BAS system for a period of one year beginning on the date of Substantial Completion.

B. Services, materials, and equipment shall include but not be limited to:
1. The adjustment, required testing, and repair of the system including all computer equipment, transmission lines, transmission equipment, sensors and control devices.
2. On-line support services shall be provided as follows:
a. The local BAS representative shall have the capability to monitor and control the facility's building automation system via a dialup connection.
b. If the problem is not resolved by local support, the national office of the building automation system manufacturer, having the same dialup capability, shall also provide online support.

1.7 SUBMITTALS

A. Pre-submittal meeting: The Contractor performing work under this Section of the specifications shall attend a meeting for coordinating the control system with major pieces of equipment including rooftop units. The meeting shall be held on the project site in the contractor's trailer or other location acceptable to the Contractor. The Contractor shall be responsible for arranging the meeting. Submittals shall be essentially complete at the time of the meeting so detailed coordination items can be discussed.

B. Submit ten (10) complete sets of documentation in the following phased delivery schedule:
1. Schedule of dampers including size, leakage, and flow characteristics.
2. Schedule of valves including leakage and flow characteristics.
3. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated. Include each control device labeled with setting or adjustable range of control.

4. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. Include the following:
   a. System schematics, including:
      1) Written sequences of operation
      2) Listing of connected data points, including connected control unit and input device.
         a) point names
         b) point addresses
      3) Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
      4) Details of control panel faces, including controls, instruments, and labeling.
      5) Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
      6) Trunk cable schematic showing programmable control unit locations and trunk data conductors.
      7) System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
      8) System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

C. Maintenance Data: For systems to include in maintenance manuals specified in Division 1. Include the following:
   1. Maintenance instructions and lists of spare parts for each type of control device.
   2. Interconnection wiring diagrams with identified and numbered system components and devices.
   3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
   4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
   5. Calibration records and list of set points.

D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

E. Upon project completion, submit operation and maintenance manuals, consisting of the following:
   1. Index sheet listing contents in alphabetical order.
   2. Manufacturer's equipment parts list of all functional components of the system.
   3. CD-ROM of system schematics including wiring diagrams.
   4. Sequence of operations
   5. As-built interconnection wiring diagrams.
   6. Operator's manual.
   7. Trunk cable schematic showing remote electronic panel locations and all trunk data.
   8. List of connected data points, including panels to which they are connected and input device (sensors, thermostat, etc.)
   9. Software and firmware operational documentation. Include the following:
      a. Software operating and upgrade manuals.
      b. Program software backup: On a magnetic media or compact disc, complete with data files.

c. Device address list.
d. Printout of software application and graphic screens.
e. Software license required by and installed for DDC workstations and control systems.

10. Software Upgrade Kit: For Owner to use in modifying software to suit future power system revisions or monitoring and control revisions.
11. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Submit product data sheets for airflow measuring devices indicating minimum placement requirements, sensor density, sensor distribution, and installed accuracy to the host control system. Submit a schedule of airflow measuring devices indicating compliance with specified accuracy at minimum and maximum airflow rates. Submit installation, operation and maintenance documentation.

1.8 QUALITY ASSURANCE

A. The BAS system shall be designed and installed, commissioned, and serviced by a manufacturer's authorized installer.

B. Manufacturer Qualifications: A firm experienced in manufacturing automatic temperature-control systems similar to those indicated for this Project and with a record of successful in-service performance.

C. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed specially for this project.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, governing radio frequency electromagnetic interference and shall be so labeled.

F. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory-mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.10 COORDINATION

A. Coordinate equipment control requirements in Division 23 Section "Packaged Rooftop Air Handling Units" to achieve compatibility with equipment and controls that interface with those systems including communication protocol, control points, set points, and alarms.

B. Control Wiring: The BAS manufacturer shall be responsible for all BAS and temperature control wiring for a complete and operable system. All wire and cable shall be plenum-rated and shall be in accordance with Division 26 specification sections and all local, state and national codes and ordinances.

C. Where plenum-rated BAS cable is routed in concealed, accessible spaces, the cable may be run in the cable trays or in J-Hooks provided under this section of the specifications. Where plenum-rated BAS cable is routed in exposed or inaccessible areas, it shall be run conduit provided under this section of the specifications.

D. Power Wiring:
   1. Power wiring indicated (device and circuit designation indicated) on the drawings shall be provided under Division 26.
   2. The BAS manufacturer shall be responsible for power wiring not indicated (device or circuit designation not indicated) on the Drawings. It shall be the BAS manufacturer's responsibility to review the Contract Documents to determine the extent of power wiring included in Division 26 and to provide additional power wiring as required. Work shall be in accordance with Division 26 specifications and all local, state and national codes and ordinances.
   3. Where the contractor performing work under this section requires an additional circuit for power wiring to a device or panel under paragraph 2 above, an RFI shall be issued requesting approval to use an available circuit in the nearest panel. Once approval is granted, all wiring and conduit from the breaker to the device or panel shall be provided under this section of the specifications.

E. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. All conduits shall be concealed within walls and above ceilings unless indicated otherwise.

F. Coordinate installation of conduit to avoid cutting of finished surfaces.

G. Coordinate equipment with Division 28 Section "Common Work Results for Electronic Safety and Security" for building security control detection system and selective annunciation and monitoring only (i.e. 'status alarms').

H. Coordinate equipment with Division 28 Section "Digital Addressable Fire Alarm" to achieve compatibility with equipment that interfaces with that system.

I. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

J. Coordinate equipment with Division 26 Section "Panelboards" to achieve compatibility with starter coils and annunciation devices.

K. Coordinate equipment with Division 26 Section "Switchboards" to achieve compatibility with power monitoring and metering devices in that equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. ACES (Allerton Controls)
   2. Siemens
   3. Trane
   4. Automated Logic

B. The design of the BAS shall network any existing operator workstations located off-site, the district supervisory server, network area controllers, and stand-alone DDC controllers. The network architecture shall consist of two levels: a high performance peer-to-peer network and DDC controller-specific local area networks. Access to the controller-specific LAN shall be totally transparent to the user when accessing data or developing control programs. The BAS shall be comprised of Network Area Controller(s) within each facility. The NAC shall connect to the owner's wide area network. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard web browsers, via the Internet and/or VPN access to the school system's WAN. Each NAC shall communicate to LonMark/LonTalk (IDC) and/or BACnet (IBC) controllers provided under this Section.

C. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

D. Peer-to-Peer Network Level: All operator devices either network resident or connected via dial-up modems shall have the ability to access all point status and application report data, and to execute control functions for any and all other devices via the peer-to-peer network. No hardware or software limits shall be imposed on the number of devices with global access to the network data at any time.
   1. Telecommunication Capability:
      a. Auto-dial/auto-answer communications shall be provided to allow DDC Controllers to communicate with remote operator stations and/or remote terminals via telephone lines, as indicated in the sequence of operations. Existing modems and existing remote host software shall be utilized to meet existing connection system.
      b. Auto-dial DDC Controllers shall automatically place calls to workstations to report alarms or other significant events. The auto-dial program shall include provisions for handling busy signals, "no answers" and incomplete data transfers.
   2. Operators at dial-up workstations shall be able to perform all control functions, all report functions and all database generation and modification functions as described for workstations connected via the network. Routines shall be provided to automatically

answer calls from remote DDC Controllers. The fact that communications are taking place with remote DDC Controllers over telephone lines shall be completely transparent to an operator.

3. Main DDC panels shall be connected via fiber. All fiber, connection hardware, and work required for connection of main panels shall be included.
4. An Ethernet connection shall be made to the exiting central maintenance host workstation. The contractor performing work under this section of the specifications shall meet with the Owner's IT or IS department and shall be responsible for providing a complete Ethernet connection over the Owner's existing network. All software, hardware, wiring, fiber, and components necessary shall be provided.

2.2 DDC EQUIPMENT

A. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.
5. Analog Outputs: Provide either modulating signal, low voltage (0- to 10-V dc) or current (4 to 20 mA) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.
6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
7. Universal I/Os: Provide software selectable binary or analog outputs.

B. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

2.3 DDC CONTROLLERS

A. No controller shall be loaded to more than 80%. IE: A controller with 20 available points shall be loaded with 16 points or less.

B. DDC controllers shall be stand-alone, multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors, communication controllers, power supplies and input/output point modules. Controller size shall be sufficient

to fully meet the requirements of the contract documents. Each controller shall support a minimum of two (2) LAN Device Networks.

C. Each DDC controller shall have sufficient memory to support its own operating system and databases, including:
   1. Control processes
   2. Energy management applications
   3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
   4. Historical/trend data for points specified.
   5. Maintenance support applications.
   6. Custom processes.
   7. Operator I/O.
   8. Dial-up communications.
   9. Manual override monitoring.

D. Each DDC controller shall support any combination of industry standard inputs and outputs.

E. Provide all processors, power supplies and communication controllers so that the implementation of a point only requires the addition of the appropriate point input/output termination module and wiring.

F. DDC controllers shall provide a minimum two RS-232C serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals. DDC controllers shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, Ethernet connections, printers, or terminals.

G. Each DDC controller shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all panel components. The DDC controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.

H. Isolation shall be provided at all peer-to-peer network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standards 587-1980.

I. In the event of the loss of normal power, there shall be an orderly shutdown of all DDC controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 100 days.
   1. Upon restoration of normal power, the DDC controller shall automatically resume full operation without manual intervention.
   2. Should DDC controller memory be lost for any reason, the system shall automatically reload the DDC controller via the local RS-232C port, via telephone line dial-in or Ethernet from the existing network workstation PC.

J. Provide a separate DDC controller for each RTU or other HVAC system. It is intended that each unique system be provided with its own point resident DDC controller.

2.4 DDC CONTROLLER RESIDENT SOFTWARE FEATURES

A. General:
   1. The software programs specified in this Section shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher-level computer for execution.

B. Control Software Description:
   1. The DDC Controllers shall have the ability to perform the following pre-tested control algorithms:
      a. Two-position control
      b. Proportional control
      c. Proportional plus integral control
      d. Proportional, integral, plus derivative control
      e. Automatic tuning of control loops

C. DDC Controllers shall have the ability to perform any or all the following energy management routines:
   1. Time-of-day scheduling
   2. Calendar-based scheduling
   3. Holiday scheduling
   4. Temporary schedule overrides
   5. Start-Stop Time Optimization
   6. Automatic Daylight Savings Time Switchover
   7. Night setback control
   8. Enthalpy switchover (economizer)
   9. Peak demand limiting
   10. Temperature-compensated duty cycling
   11. Trending

D. DDC Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.

E. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each DDC Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the DDC Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.

F. A variety of historical data collection utilities shall be provided to manually or automatically sample, store and display system data for points as specified.

2.5 APPLICATION SPECIFIC CONTROLLERS (ASC)

A. Each DDC Controller shall be able to extend its performance and capacity using remote application specific controllers (ASCs) through LAN Device Networks.

B. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor. Provide the following types of ASCs as a minimum:
   1. Terminal Equipment Controllers
      a. Terminal Box (VAV box controllers) should have a differential pressure transmitter (transducer) accuracy of 0.015-inches w.g. or less.

C. Each ASC shall be capable of control of the terminal device independent of the manufacturer of the terminal device.

D. Terminal Equipment Controllers:
   1. Provide for control of each piece of equipment , including, but not limited to, the following:
      a. Terminal Units
      b. Exhaust fans

2.6 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters and Resistance Temperature Detectors and Transmitters:
   1. Accuracy: Plus or minus 0.5 deg F at calibration point.
   2. Wire: Twisted, shielded-pair cable.
   3. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
   4. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft.
   5. Insertion Elements for Liquids: Brass or stainless steel socket with minimum insertion length of 2-1/2 inches.
   6. Room Sensor Cover Construction: Manufacturer's standard locking covers.
      a. Set-Point Adjustment (non-secure zones): Warmer/cooler adjustment. Range of adjustment shall be programmable through the BAS.
      b. Set-Point Adjustment (secure zones): Concealed.
      c. Set-Point Indication (non-secure zones): LCD display.
      d. Set-Point Indication (secure zones): Concealed.
      e. Thermometer (non-secure zones): LCD display.
      f. Thermometer (secure zones): Concealed.
      g. Color: Manufacturer's standard.
      h. Orientation: Vertical.
   7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
   8. Specific Sensor Type Locations: In corridors, lobbies, stairs, restrooms/toilets, locker rooms, booking, sally ports, secure areas & common area locations, provide blank stainless-steel cover plate sensors with insulated back and security screws.

C. Humidity Sensors: Capacitance or bulk polymer resistance type.
   1. Accuracy: 5 percent full range with linear output.

2. Room Sensor Range: 20 to 80 percent relative humidity.
3. Room Sensor Cover Construction: Manufacturer's standard locking covers.
   a. Color: Manufacturer's standard.
   b. Orientation: Vertical.
4. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of 0 to 185 deg F.
5. Duct-Mounted: Electric insertion, 2-position type with adjustable, 2 percent throttling range, 20 to 80 percent operating range, and single- or double-pole contacts.

D. Carbon-Dioxide Sensor:
1. Sensor: solid-state infrared
2. LED indicator transitions between green, yellow, and red as CO2 threshold is exceeded. Yellow at 1000 PPM, and Red above 1500 PPM.
3. Temperature range: 23 to 130 deg F, calibrated for 0 to 2 percent, with continuous or averaged reading
4. Mounting: Wall

E. Pressure Transmitters/Transducers:
1. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input and temperature-compensated.
   a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
   b. Output: 4 to 20 mA.
   c. Building Static-Pressure Range: 0- to 0.25-inch wg.
   d. Duct Static-Pressure Range: 0- to 5-inch wg.
2. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
3. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
4. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential. Accuracy shall be +/- 5% of range.
5. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.

F. Current Sensing Switch:
1. Sensor supply voltage and supply current shall be induced from monitored conductor. Contact rating shall be 0.2 amperes at 30 volts DC/AC. Trip set point shall be adjustable to +/-1% of range. Current sensing switch wiring shall not be polarity sensitive.

G. Liquid Level Sensors:
1. Liquid level sensors shall have ½" accuracy calibrated to detect water in temperature range from 60°F to 80°F. Output signal shall be 4 to 20 mA. Sensor material shall be stainless steel or other non-corrosive material.

2.7 FLOW METERS

A. Manufacturer: Onicon F-1110 or approved equal.

B. Provide complete hardware necessary to enable insertion and removal of the meter without system shutdown.

1. Provide NSF 61 version for domestic water systems.
2. The flow meter shall be hand-insertable up to 400 psi.
3. The flow meter shall have two contra-rotating axial turbines, with electronic impedance-based sensing and an averaging circuit to reduce measurement errors due to swirl and flow profile distortion.
4. Wetted metal components shall be 316L SS.
5. The flow meter shall be individually wet-calibrated against a primary volumetric standard that is accurate to within 0.1% and traceable to NIST (National Institute of Standards and Technology). The manufacturer's certificate of calibration shall be provided with each flow meter. Accuracy shall be within ± 0.5% of rate at the calibrated velocity, within ± 1% of rate over a 10:1 turndown (3.0 to 30 ft/s) and within ± 2% of rate over a 50:1 turndown (from 0.4 to 20 ft/s).
6. The flow meter shall include integral analog output(s), 4-20 mA, 0-10V, or 0-5V and be field configured to output the 4-20 mA signal.
    a. If the BAS system cannot directly monitor a 4-20mA input signal, the contractor shall furnish a resistor at the BAS input to convert this 4-20mA signal to a voltage input. If the BAS input supports a 0-10v input, use a precision 500Ω resistor.
7. The flow meter shall be covered by the manufacturer's two-year warranty.
8. Additional Components:
    a. Provide the Optional Flow Display: Provide a D-100 Series Display Module for remote indication of flow rate and/or total.
    b. Provide a legend plate indicating the units the display is showing (GPM) and the system it serves (DHW Loop).
    c. Provide the Optional Installation Kit: This kit shall include:
        1) 1" Full Port bronze ball valve
        2) 1" Brass close nipple
        3) 1" Weld-on carbon steel branch outlet

2.8 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.

B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.

C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

H. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

2.9 CARBON MONOXIDE SENSORS AND TRANSMITTERS

A. ACI Q5/B5 Series with CO-250P and NO2-10P gas detection sensors. Unit shall include relays to control ventilation fan and make-up air damper and programming to enabled relays when CO and/or NO2 levels are above set point. When CO and/or NO2 levels continue to rise above high limit, sensor shall provide Audible Alarm. All setpoints shall be set to UL levels for this vehicle garage/ maintenance use applications and control system shall be UL 2075 listed.

2.10 FLOW MEASURING STATIONS

A. Duct Airflow Station:
   1. Qualifications: The manufacturer shall have a minimum of ten years experience producing products of this type.
   2. Acceptable Manufacturers: Subject to compliance with requirements, provide products by Ebtron Inc. Unless otherwise noted model numbers shall be as follows:
      a. Model GTx116-PC for ducts and plenums.
      b. Model GTx116-F for fan inlet applications.
   3. Alternative Manufacturers: Alternative manufacturers may be submitted as a substitution in accordance with Division 1 specification requirements. Superior performance or lower cost to the owner must be provided. Acceptance shall be at the sole discretion of the architect.
   4. Special Warranty: In addition to other required warranties provide 3 years on parts from the date of unit shipment.
   5. Delivery, Storage and Handling: All handling and storage procedures shall be per manufacturer's recommendations. Airflow measuring devices shall be kept clean and dry, protected from weather and construction traffic.
   6. Provide airflow/temperature measurement devices where indicated on the plans. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans.
   7. The measurement device shall consist of one or more sensor probe assemblies and a single, remotely mounted, microprocessor-based transmitter. Each sensor probe assembly shall contain one or more independently wired sensor housings. The airflow and temperature readings, calculated for each sensor housing, shall be equally weighted and averaged by the transmitter prior to output. Pitot tubes and arrays are not acceptable. Vortex shedding flow meters are not acceptable.
   8. Sensor Probe Assemblies:
      a. Sensor housings shall be manufactured of a U.L. listed engineered thermoplastic.

b. Sensor housings shall utilize two hermetically sealed, bead-in-glass thermistor probes to determine airflow rate and ambient temperature. Devices that use "chip" or diode case type thermistors are unacceptable. Devices that do not have 2 thermistors in each sensor housing are not acceptable.
c. Sensor housings shall be calibrated at a minimum of 16 airflow rates and have an accuracy of +/-2% of reading over the entire operating airflow range.
d. Each sensor housing shall be calibrated to standards that are traceable to the National Institute of Standards and Technology (NIST).
e. Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.
f. Operating temperature range for the sensor probe assembly shall be -20° F to 160° F. The operating humidity range for the sensor probe assembly shall be 0-99% RH (non-condensing).
g. Each temperature sensor shall be calibrated at a minimum of 3 temperatures and have an accuracy of +/-0.15° F over the entire operating temperature range. Each temperature sensor shall be calibrated to standards that are traceable to the National Institute of Standards and Technology (NIST).
h. Each sensor probe assembly shall have an integral, U.L. listed, plenum rated cable and terminal plug for connection to the remotely mounted transmitter. All terminal plug interconnecting pins shall be gold plated.
i. Each sensor assembly shall not require matching to the transmitter in the field.
j. A single manufacturer shall provide both the airflow/temperature measuring probe(s) and transmitter at a given measurement location.

9. Duct and Plenum Sensor Probe Assemblies:
   a. Sensor housings shall be mounted in an extruded, 6063 aluminum tube probe assembly.
   b. Thermistor probes shall be mounted in sensor housings using an epoxy resin.
   c. All thermister probe wires shall be contained within the aluminum tube probe assembly.
   d. The number of sensor housings provided for each location shall be as follows:

	Area (sq.ft.)	Sensors
2)	<2	4
3)	2 to <4	6
4)	4 to <8	8
5)	8 to <16	12
6)	>=16	16

   e. Probe assembly mounting brackets shall be constructed of 304 stainless steel. Probe assemblies shall be mounted using one of the following options:
      1) Insertion mounted through the side or top of the duct
      2) Internally mounted inside the duct or plenum
      3) Standoff mounted inside the plenum
   f. The operating airflow range shall be 0 to 5,000 FPM unless otherwise indicated.
10. Fan Inlet Sensor Probe Assemblies:
   a. Sensor housings shall be mounted on 304 stainless steel blocks.
   b. Mounting rods shall be field adjustable to fit the fan inlet and constructed of nickel plated steel.
   c. Mounting feet shall be constructed of 304 stainless steel.
   d. The operating airflow range shall be 0 to 10,000 FPM unless otherwise indicated.
11. Transmitters:

a. The transmitter shall have a 16 character alpha-numeric display capable of displaying airflow, temperature, system status, configuration settings and diagnostics. Configuration settings and diagnostics shall be accessed through a pushbutton interface on the main circuit board. Airflow shall be field configurable to be displayed as a velocity or a volumetric rate.
b. The transmitter shall be capable of:
   1) Independently monitoring and averaging up to 16 individual airflow and temperature readings.
   2) Displaying the airflow and temperature readings of individual sensors on the LCD display.
c. The transmitter shall have a power switch and operate on 24 VAC (isolation not required). The transmitter shall use a switching power supply fused and protected from transients and power surges.
d. All interconnecting pins, headers and connections on the main circuit board, option cards and cable receptacles shall be gold plated.
e. The operating temperature range for the transmitter shall be -20° F to 120° F. The transmitter shall be protected from weather and water.
f. The transmitter shall be capable of communicating with the BAS using one of the following interface options:
   1) Linear analog output signal: Field selectable, fuse protected and isolated, 0-10VDC and 4-20mA (4-wire)
   2) RS-485: Field selectable BACnet-MS/TP, ModBus-RTU and Johnson Controls N2 Bus
   3) Base-T Ethernet: Field selectable BACnet Ethernet, BACnet-IP, ModBus-TCP and TCP/IP
   4) LonWorks Free Topology
g. The transmitter shall have an infra-red interface capable of downloading individual sensor airflow and temperature data or uploading transmitter configuration data to a handheld PDA (Palm or Microsoft Pocket PC operating systems).
h. The measuring device shall be UL listed as an entire assembly.
i. The manufacturer's authorized representative shall review and approve placement and operating airflow rates for each measurement location indicated. A written report shall be submitted to the architect should any measurement location not meet the manufacturer's placement requirements.

12. Installation: Install in accordance with manufacturer's instructions at locations indicated. A written report shall be submitted to the architect if any discrepancies are found.
13. Adjusting: Duct and plenum devices shall not be adjusted without the architect's approval.

2.11 THERMOSTATS

A. Available Manufacturers:
   1. Danfoss Inc.; Air-Conditioning and Refrigeration Div.
   2. Heat-Timer Corporation.
   3. Tekmar Control Systems, Inc.

B. Combination Thermostat and Fan Switches: Line-voltage thermostat with push-button or lever-operated fan switch.

1. Label switches "FAN ON-OFF" or "FAN HIGH-LOW-OFF" or "FAN HIGH-MED-LOW-OFF."
2. Mount on single electric switch box.

C. Electric, solid-state, microcomputer-based room thermostat with remote sensor.
1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Set up for four separate temperatures per day.
4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
5. Short-cycle protection.
6. Programming based on every day of week.
7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
8. Battery replacement without program loss.
9. Thermostat display features include the following:
   a. Time of day.
   b. Actual room temperature.
   c. Programmed temperature.
   d. Programmed time.
   e. Duration of timed override.
   f. Day of week.
   g. System mode indications include "heating," "off," "fan auto," and "fan on."

D. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

E. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
2. Selector Switch: Integral, manual on-off-auto.

F. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.
2. Bulbs in air ducts with flanges and shields.
3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit; adequately supported.
4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
5. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.
6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

G. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.

H. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type; with adjustable set point in middle of range, adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

I. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic- reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

J. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic- reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

K. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, with molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig, and cast housing with position indicator and adjusting knob.

2.12 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Valves: Size for torque required for valve close off at maximum pump differential pressure.
2. Dampers: Size for running torque calculated as follows:
   a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
   b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
   e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
   f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.
3. Coupling: V-bolt and V-shaped, toothed cradle.
4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
6. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
7. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
8. Temperature Rating: Minus 22 to plus 122 deg F.
9. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.

2.13 DAMPERS

A. Dampers: AMCA-rated, parallel or opposed-blade design; 0.108-inch- minimum thick, galvanized-steel or 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- thick galvanized steel with maximum blade width of 8 inches and length of 48 inches.

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with oil-impregnated sintered bronze blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.
4. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.14 SMOKE DETECTORS

A. Smoke detectors shall be furnished under Division 28 and installed under this Section.

B. Wiring from smoke detectors to fire alarm system shall be under Division 28.

C. Wiring from smoke detectors to mechanical equipment shall be under this Section.

2.15 LOW TEMPERATURE DETECTION STAT: By BAS manufacturer

2.16 CURRENT SENSING RELAYS: By controls contractor for all equipment.

2.17 MISCELLANEOUS RELAYS AND SWITCHES:

A. General: Where required by the sequence of operation switches, relays, and miscellaneous devices necessary to accomplish the sequence shall be provided under this section.

PART 3 - EXECUTION

3.1 PROJECT MANAGEMENT

A. Provide a designated project manager who will be responsible for the following:
1. Construct and maintain project schedule
2. On-site coordination with all applicable trades and subcontractors
3. Authorized to accept and execute orders or instructions from owner/architect
4. Attend project meetings as necessary to avoid conflicts and delays
5. Make necessary field decisions relating to this scope of work
6. Coordination/Single point of contact.

3.2 EXAMINATION

A. Verify that power supply is available to control units and operator workstation.

B. Verify that duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.3 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified in Section 23 section "Sequences of Control."

C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices next to light switch(es) when space is available with top of device at 48 inches above finished floor. Where space next to light switch(es) is not available, align device vertically with light switch and locate device with top at 40 inches above the finished floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

D. Install automatic dampers according to Division 23 Section "Air Duct Accessories."

E. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

F. Install labels and nameplates to identify control components according to Division 23 Section "Identification for HVAC Piping and Equipment."

G. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

3.4 INTERLOCKING AND CONTROL WIRING

A. Provide interlock and control wiring. Wiring shall be installed neatly and professionally, in accordance with Specification Division 26 and national, state and local electrical codes.

B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Provide shielded low capacitance wire for communications trunks.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of control equipment with the owner's representative prior to rough-in.

D. Provide auxiliary pilot duty relays on motor starters as required for control function.

E. Provide power for control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate with electrical contractor.

F. Control wiring in the mechanical, electrical, telephone and boiler rooms to be installed in raceways. Other wiring to be installed neatly and inconspicuously per local code requirements. If local code allows, control wiring above accessible ceiling spaces may be run with plenum-rated cable (without conduit).

3.5 START-UP AND COMMISSIONING

A. When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. Verify that all systems are operable from local controls in the specified failure mode upon panel failure or loss of power.

B. Provide any recommendation for system modification in writing to Architect. Do not make any system modification, including operating parameters and control settings, without prior approval of the Architect.

C. Provide approved commissioning plan and document that each component of the system has been inspected, tested, loop tuned, and commissioned.

D. BAS contractor shall have two (2) technicians available to the CA throughout the system verification and FPT phase of the commissioning process. One of the technicians shall be familiar with the controls software and programming and the other shall be capable of making controls system hardware repairs during FPT (if one technician can perform both functions, then only one shall be required). The BAS contractor shall also submit a copy of his controls point to point checkout to the CA prior to the start of the mechanical system FPT.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
6. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
7. Check temperature instruments and material and length of sensing elements.
8. Check control valves. Verify that they are in correct direction.
9. Check DDC system as follows:

    a. Verify that DDC controller power supply is from emergency power supply.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.7 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.

2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:

    a. Check analog inputs at 0, 50, and 100 percent of span.
    b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
    c. Check digital inputs using jumper wire.
    d. Check digital outputs using ohmmeter to test for contact making or breaking.
    e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:

    a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
    b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:

    a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
    b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:

    a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
10. Provide diagnostic and test instruments for calibration and adjustment of system.
11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.8 TRAINING

A. Provide 4 hours of training for Owner's designated operating personnel. Training shall include:
   1. Explanation of drawings and operation & maintenance manuals
   2. Walk-through of the job to locate control components
   3. Operator workstation and peripherals
   4. Operation of Portable computer
   5. DDC controller and ASC operation/function
   6. Operator control functions including graphic generation and field panel programming
   7. Explanation of adjustment, calibration and replacement procedures

B. Since the Owner may require personnel to have more comprehensive understanding of the hardware and software, additional training must be available from the Manufacturer. If necessary additional training will be contracted by the Owner at a later date.

C. Coordinate with Owner if video recording documentation of training is required.

END OF SECTION 230900

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and Contract Documents apply to this Section.

1.2 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

B. Related Sections include the following:

1. Division 23 Section "Building Automation System" for control equipment, devices and submittal requirements.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. CO_2: Carbon dioxide.

C. DDC: Direct digital control.

D. PPM: Parts per million.

E. RPM: Revolutions per minute.

F. VFD: Variable-frequency drive

1.4 GENERAL REQUIREMENTS OF THIS SECTION

A. Control sequences shall be accomplished in accordance with control drawings and the sequences specified in this section. It is the intent of this section to utilize sequences included in pre-programmed controllers when such sequences provide the intended operation.

B. Points may not be deleted without prior approval from the Architect.

C. Every attempt has been made to indicate all required points on the control drawings. Occasionally an additional point, or points, may be required to accomplish a specified sequence. The contractor performing work under this section shall understand the work to be implied and required by the contract documents. Additional hardware and software required shall be provided under section "Building Automation System" at no additional cost to the owner.

1. Such points include:

a. Sensors of all types whether or not specified under section "Building Automation System"
b. Flow measuring stations.
c. Wiring, conduit, and related devices such as relays.

2. Exceptions:
a. Equipment and devices covered under sections other than "Building Automation System."

1.5 DISPLAY GRAPHICS:

A. Include system schematic for each system. Indicate all points in system on at least one graphic.

B. Indicate all commanded values and temperatures.

C. Indicate all sensed temperatures.

D. Indicate all alarms.

E. Indicate all status points.

F. Indicate all monitored conditions.

1.6 WARRANTY

A. Provide all services, materials and equipment necessary for the successful operation of the entire BAS system for a period of one year beginning on the date of substantial completion.

1.7 SUBMITTALS

A. Refer to section "Building Automation System."

PART 2 - SEQUENCES

2.1 SET POINTS: Unless indicated otherwise all set points shall be adjustable from the head end.

2.2 OCCUPIED / UNOCCUPIED

A. The BAS shall institute occupied and unoccupied control sequences based on a time-of-day schedule furnished by the Owner.

B. The Owner shall have the capability to program holidays and special functions.

C. The Owner shall have the ability to override occupied and unoccupied operation of each piece of equipment from the head end.

2.3 OPTIMUM START/STOP:

A. The BAS shall institute optimum start strategies for morning warm up and cool down functions. Equipment shall start early enough to restore occupied temperature set points 30 minutes prior to occupancy.

B. The BAS shall institute optimum stop strategies for shutting down units before scheduled unoccupied operation to allow zones to coast to unoccupied operation without affecting occupied set points.

2.4 OUTSIDE AIR SENSORS:

A. Temperature: The BAS shall monitor outside air temperature as sensed by the outside air temperature sensor.

B. Humidity: The BAS shall monitor outside air relative humidity as sensed by the outside air humidity sensor.

2.5 GENERAL SYSTEM REQUIREMENTS

A. System Failure: The control system shall be installed to fail safe to heating mode.
1. All air handling units shall fail with outside air dampers closed.
2. Night setback shall fail to occupied mode.
3. All interlocked fans shall be de-energized with dampers closed.

2.6 PACKAGED VAV AIR HANDLING UNIT (RTU-1)

A. General: This air handling unit includes a variable speed supply and relief fan, modulating outside air damper, modulating return air damper, modulating & staged packaged direct expansion cooling, modulating electric pre-heat, and outdoor air flow measuring station. It provides temperature control for multiple zones. Unit controls are factory installed and provided by unit manufacturer with BACnet interface with BAS head end.

B. Initial Set Points:
1. General:
a. Leaving Air Temperature Set Point: 55°F
b. Maximum Return Air Humidity Set Point: 55%
c. Duct Static Pressure Set Point: Set by TAB agent.

C. Enable/Disable:
1. Occupied Operation: During occupied hours, the BAS shall enable the unit, and it shall operate under its own controls.
2. Unoccupied Operation: During unoccupied hours, the BAS shall disable the unit.
a. Unoccupied Heating: Should any two (2) space temperatures fall below the unoccupied heating space temperature set point, the unit shall be started in the warm-up mode until all space temperatures rise 5°F above the unoccupied heating space temperature set point.

b. Unoccupied Cooling: Should any two (2) space temperatures rise above the unoccupied cooling space temperature set point, the unit shall be started in the cool-down mode until all space temperatures fall 5°F below the unoccupied cooling space temperature set point.

3. Warm-up Operation: The BAS shall optimize the early start of the unit in warm-up mode to reach the occupied space heating set point by the occupied time. During warm-up operation the unit shall operate as in unoccupied mode (outside air damper closed) to maintain occupied set points.
4. Cool-down Operation: The BAS shall optimize the early start of the unit in cool-down mode to reach the occupied space cooling set point by the occupied time. During cool-down operation the unit shall operate as in unoccupied mode (outside air damper closed) to maintain occupied set points.
5. Startup: Start time shall be based on the BAS optimum start programming in accordance with a predetermined schedule to be furnished by the Owner and programmed into the BAS. The outside air damper shall remain closed while the unit operates in warm-up/cool-down mode to restore occupied set points. At occupancy time, the unit shall begin to modulate the outside air damper in accordance with its sequence of control.

D. Dead band: A five-degree (5°F) dead band shall be maintained between heating and cooling set points at all times. This shall not be an adjustable value on the head end graphics.

E. Life Safety: Duct smoke detectors located in the return air duct, upon detection of products of combustion from any detector, signal the building fire alarm system and shut down the unit & supply fan. This function shall be manually reset from the unit and shall be so identified on the head-end graphics. An alarm shall also be provided to the BAS head-end.

F. System Safety: Whenever the supply fan is stopped or airflow ceases for any reason (as sensed by the motor status sensing circuit), the supply fan shall be deactivated and alarm issued to BAS. In all modes of operation, commanded position values for all control devices such as dampers shall be readable from the head-end.

G. Condensate Pan Overflow Prevention: The unit shall monitor float switches in the condensate pan under the evaporator. If the float switch detects the pan is about to overflow and has reached its high limit, the unit shall disable the cooling and issue an alarm to the BAS.

H. Filter Change Alarm: The differential pressure across the filters shall be monitored, where if the differential pressure exceeds 1" wg (adjustable), an alarm is issued to BAS.

2.7 PACKAGED CAV AIR HANDLING UNIT (RTU-2)

A. General: This air handling unit includes a constant speed supply fan, manual outside air damper, modulating & staged packaged direct expansion cooling, staged gas burner. It provides temperature control for a single zone. Unit controls are factory installed and provided by unit manufacturer with BACnet interface with BAS head end.

B. Initial Set Points:

1. Occupied Mode:

a. Cooling: 80° F

b. Heating: 60° F

C. Enable/Disable:
1. Occupied Operation: The unit shall always be in occupied operation.

D. Dead band: A five-degree (5°F) dead band shall be maintained between heating and cooling set points at all times. This shall not be an adjustable value on the head end graphics.

E. System Safety: Whenever the supply fan is stopped or airflow ceases for any reason (as sensed by the motor status sensing circuit), the supply fan shall be deactivated and alarm issued to BAS. In all modes of operation, commanded position values for all control devices such as dampers shall be readable from the head-end.

F. Condensate Pan Overflow Prevention: The unit shall monitor float switches in the condensate pan under the evaporator. If the float switch detects the pan is about to overflow and has reached its high limit, the unit shall disable the cooling and issue an alarm to the BAS.

2.8 PARALLEL FAN POWERED TERMINAL UNIT WITH STEP CONTROLLED ELECTRIC HEAT

A. DESCRIPTION: Cooling & heating, ceiling mounted, parallel (intermittently) fan powered, primary air control, variable air volume terminal unit. The unit contains a characterized damper, a pitot type flow measuring device with transducer, a fan in parallel with primary air, and a step controlled electric heating coil. The velocity of air, as sensed by the flow sensor/transducer combination using a calculation with a known diameter provides flow (CFM) information to the BAS. The temperature of the space, as sensed by the space temperature sensor, allows the controller to determine the required CFM for cooling, when to start the fan, when to start and where to set the number of steps of electric heat.

B. Set points

1. Occupied Mode:

a. Cooling: 75° F
b. Heating: 70° F

2. Unoccupied Mode:

a. Cooling: 85° F
b. Heating: 55° F

C. Cooling:

1. On a rise in space temperature, as sensed by the space temperature sensor, above the cooling set point, the BAS shall modulate the terminal unit air valve open in response to the increase in space temperature until the maximum indicated CFM is reached.

2. On a fall in space temperature, as sensed by the space temperature sensor, the reverse shall occur until the minimum indicated CFM is reached.

D. Heating:

1. On fall in space temperature, as sensed by the space temperature sensor, to the heating set point the BAS shall start the terminal unit fan.
2. On a continued fall in space temperature, as sensed by the space temperature sensor, the BAS shall stage on each step of electric heat to maintain space temperature.
3. On a rise in space temperature, as sensed by the space temperature sensor, the reverse shall occur.

E. Fan:
1. First stage of heat and should be cycled on/off during unoccupied mode to maintain heating set point.

F. Morning Warm-Up/Cool-Down
1. If zone temperature is below the occupied heating set point, the BAS shall open the air valve fully, start the terminal unit fan and fully energize the electric heating coil.
2. If zone temperature is above the occupied cooling set point, the BAS shall open the air valve fully.

G. Unoccupied Heating
1. On fall in space temperature, as sensed by the space temperature sensor, to the unoccupied heating set point the BAS shall start the terminal unit fan and energize all stages of electric heat.
2. On a rise in space temperature, as sensed by the space temperature sensor, to five degrees above the unoccupied space temperature set point, the reverse shall occur.

H. Monitoring points: The following information shall be sent to the BAS by the unitary controller and subsequently displayed on the head end graphics.
1. Electric heat status.
2. Electric heat alarm.
3. Air valve position feedback.
4. Measured/calculated primary air flow.
5. Fan status

I. Dead band: A five-degree (5°F) dead band shall be maintained between heating and cooling set points at all times. This shall not be an adjustable value on the head end graphics.

2.9 TERMINAL UNIT WITH STEP CONTROLLED ELECTRIC HEAT

A. DESCRIPTION: Cooling & heating with step control of electric heating coil, ceiling mounted, primary air control, variable air volume terminal unit. The unit contains a characterized damper, a pitot type velocity measuring device with transducer, and an electric heating coil. The velocity of air, as sensed by the velocity sensor/transducer combination using a calculation with a known diameter provides flow (CFM) information to the BAS. The temperature of the space, as sensed by the space temperature sensor, allows the controller to determine the required CFM for cooling, when to start the electric heating coil, and what capacity to require from the electric heating coil.

B. Set points

1. Occupied Mode:

a. Cooling: 75° F
b. Heating: 70° F

2. Unoccupied:

a. Cooling: 85° F
b. Heating: 55° F

C. Cooling:

1. On a rise in space temperature, as sensed by the space temperature sensor, above the cooling set point, the BAS shall modulate the terminal unit air valve open in response to the increase in space temperature until the maximum cooling indicated CFM is reached.

2. On a fall in space temperature, as sensed by the space temperature sensor, the reverse shall occur until the minimum cooling indicated CFM is reached.

D. Heating:

1. On a fall in space temperature, as sensed by the space temperature sensor, the BAS shall adjust the air valve to maintain the scheduled heating indicated CFM and stage on each step of electric heat to maintain space temperature.

2. On a rise in space temperature, as sensed by the space temperature sensor, the reverse shall occur.

E. Monitoring points: The following information shall be sent to the BAS by the unitary controller and subsequently displayed on the head end graphics.

1. Electric heat status.

2. Electric heat alarm.

3. Air valve position feedback.

4. Measured/calculated primary air flow.

F. Dead band: A five-degree (5°F) dead band shall be maintained between heating and cooling set points at all times. This shall not be an adjustable value on the head end graphics.

2.10 PARALLEL FAN POWERED TERMINAL UNIT WITH STEP CONTROLLED ELECTRIC HEAT AND CO2 SENSOR

A. DESCRIPTION: Cooling & heating, ceiling mounted, parallel (intermittently) fan powered, primary air control, variable air volume terminal unit. The unit contains a characterized damper, a pitot type flow measuring device with transducer, a fan in parallel with primary air, and a step controlled electric heating coil. The velocity of air, as sensed by the flow sensor/transducer combination using a calculation with a known diameter provides flow (CFM) information to the BAS. The temperature of the space, as sensed by the space temperature sensor, allows the controller to determine the required CFM for cooling, when to start the fan, when to start and where to set the number of steps of electric heat.

B. Set points

1. Occupied Mode:

a. Cooling: 75° F
b. Heating: 70° F
c. CO2: 1000 ppm

2. Unoccupied Mode:

a. Cooling: 85° F
b. Heating: 55° F
c. CO2: N/A

C. Cooling:

1. On a rise in space temperature, as sensed by the space temperature sensor, above the cooling set point, the BAS shall modulate the terminal unit air valve open in response to the increase in space temperature until the maximum indicated CFM is reached.

2. On a fall in space temperature, as sensed by the space temperature sensor, the reverse shall occur until the minimum indicated CFM is reached.

D. Heating:

1. On fall in space temperature, as sensed by the space temperature sensor, to the heating set point the BAS shall start the terminal unit fan.

2. On a continued fall in space temperature, as sensed by the space temperature sensor, the BAS shall stage on each step of electric heat to maintain space temperature.

3. On a rise in space temperature, as sensed by the space temperature sensor, the reverse shall occur.

E. Fan:

1. First stage of heat and should be cycled on/off during unoccupied mode to maintain heating set point.

F. Morning Warm-Up/Cool-Down

1. If zone temperature is below the occupied heating set point, the BAS shall open the air valve fully, start the terminal unit fan and fully energize the electric heating coil.

2. If zone temperature is above the occupied cooling set point, the BAS shall open the air valve fully.

G. Unoccupied Heating

1. On fall in space temperature, as sensed by the space temperature sensor, to the unoccupied heating set point the BAS shall start the terminal unit fan and energize all stages of electric heat.

2. On a rise in space temperature, as sensed by the space temperature sensor, to five degrees above the unoccupied space temperature set point, the reverse shall occur.

H. Monitoring points: The following information shall be sent to the BAS by the unitary controller and subsequently displayed on the head end graphics.

1. Electric heat status.
2. Electric heat alarm.
3. Air valve position feedback.
4. Measured/calculated primary air flow.
5. Fan status

I. Dead band: A five-degree (5°F) dead band shall be maintained between heating and cooling set points at all times. This shall not be an adjustable value on the head end graphics.

J. CO2 Control: The scheduled minimum airflow setting of the terminal unit will be overridden to allow the terminal unit to provide the minimum airflow necessary to maintain the CO2 level at setpoint (as sensed by the space CO2 sensor). On a fall in CO2 below setpoint, the minimum airflow shall be lowered until the CO2 setpoint is reached or until the terminal unit air valve is at 20%. On a rise in CO2 above set point, the minimum airflow shall be raised until the CO2 setpoint is reached or until the scheduled minimum airflow is reached. Actual control of the air valve shall be temperature. CO2 will only affect the minimum airflow setpoint. If the minimum is set to scheduled minimum airflow and CO2 rises above 1500 ppm (adj), the BAS shall send an alarm to the head end identifying the "Room" (as assigned by the Owner or Architect during construction) and stating the Room has high CO2.

2.11 COMPUTER ROOM AIR CONDITIONING UNITS/ SPLIT SYSTEMS

A. Each unit shall operate on its factory-installed control system.

B. The BAS shall monitor the space temperature in the rooms served by Ductless Split Systems. These sensors are used for monitoring purposes and shall alarm if they deviate more from the below set points:

1. Alarm High Limit Temperature: 85°F.

C. The BAS shall monitor the computer room air conditioning unit control panel for alarm status. If the split system unit controls report an alarm, the BAS shall forward an alarm to the head end identifying the unit and stating the unit has reported an alarm.

2.12 EXHAUST FANS – CONTROL METHOD BAS SCHEDULE

A. General: These are general duty fans that operate on a time-of-day schedule. Refer to the Fan Schedule for fan information.

B. Occupied/Unoccupied:
1. Unoccupied Operation: During unoccupied hours, the fan shall be off and the damper shall be closed.
2. Occupied Operation: During occupied hours, the fan shall be on and the damper shall be open.

C. Start:

1. At the start of occupied operation, the BAS shall open the motorized damper associated with the fan. Once the damper is confirmed open, the BAS shall start the fan. If the damper is interlocked with fan operation, then the BAS shall start the fan.

D. Stop:
1. At the beginning of unoccupied operation, the BAS shall stop the fan and close the associated damper (or just stop the fan if the damper is interlocked).

E. Fan failure alarm:
1. If the fan fails to start (as sensed by its current sensing relay), an alarm shall be sent to the head end identifying the fan and stating that is has failed to start.

2.13 FAN (Control Method BAS Special)

A. General: This system includes a single roof mounted exhaust fan and roof mounted gravity ventilator with motorized damper, all which shall be controlled by BAS to provide emergency exhaust during high CO and NO2 levels in the space. A CO/NO2 sensors with factory safety relays will be monitored to trigger the exhaust fan.

B. Operation:

1. If the space toxic and combustible gas detection system sense levels above the initial yellow safety setpoint, through the factory sensor safety enable relay, factory calibrated (initially 25ppm CO, 0.7 ppm NO_2), the intake damper shall be opened and fan shall start. The fan shall operate until the factory calibrated relay is cleared.

2. The Intake Dampers shall be interlocked with the fan operation. If the fan is enabled, the intake dampers shall be opened by the BAS. If the fan is off, the intake dampers should be shut by the BAS.

C. Equipment monitoring alarm:

1. If the fan fails to start (as sensed by its current sensing relay) an alarm shall be sent to the head end identifying the fan and stating that is has failed to start.

2.14 EMERGENCY GENERATOR MONITORING

A. The BAS shall monitor the emergency generator for alarm status. If the generator controls report an alarm, the BAS shall forward an alarm to the head end stating that the emergency generator has reported an alarm.

2.15 ELECTRICITY METERING

A. General: The BAS shall monitor electricity demand continuously through the electrical main distribution panel. The BAS shall calculate, record, and collect energy usage.

B. Phase monitor: If any phase goes down, BAS shall shut down all 3 phase equipment to provide additional protection.

C. The BAS shall calculate, record, and collect energy consumption variables including: KW and KWH.

D. The BAS shall provide trend reports and display on the BAS. The reports shall be daily, monthly, and yearly as follows:
   1. Daily:
   2. Monthly:
   3. Yearly:

END OF SECTION 230993

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Pre-submittal meeting: The contractor performing work under this section of the specifications shall attend a meeting for the purpose of coordinating with the control system. The meeting shall be held on the project site in the contractor's trailer or other location acceptable to the contractor. The contractor shall be responsible for arranging the meeting. Submittals shall be essentially complete at the time of the meeting so detailed coordination items can be discussed.

B. Product Data: For each type of the following:
   1. Pressure-seal fittings.
   2. Valves-Include flow and pressure drop curves/information based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow control valves.
   3. Air control devices.
   4. Chemical treatment.
   5. Hydronic specialties.

C. Maintenance Data: For hydronic specialties, balancing valves, automatic flow control valves, and special-duty valves to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

1.4 COORDINATION

A. Coordinate layout and installation of hydronic piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate pipe sleeve installations for foundation wall penetrations.

C. Coordinate piping installation with roof curbs, equipment supports, and roof penetrations. Roof specialties are specified in Division 7 Sections.

D. Coordinate pipe fitting pressure classes with products specified in related Sections.

E. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Concrete, reinforcement, and formwork requirements are specified in Division 3 Sections.

F. Coordinate installation of pipe sleeves for penetrations through exterior walls and floor assemblies. Coordinate with requirements for firestopping specified in Division 7 Section "Penetration Firestopping Systems" for fire and smoke wall and floor assemblies.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping, components, and installation shall withstand the following minimum working pressure and temperature unless otherwise indicated: 150 psig at 200 degrees F.

2.2 PIPING MATERIALS

A. General: Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K. (underground installations)

C. DWV Copper Tubing: ASTM B 306, Type DWV.

D. Wrought-Copper Fittings: ASME B16.22.

E. Copper or Bronze Pressure-Seal Fittings:

1. Manufacturers:
   a. Elkhart Products Corporation.
   b. Mueller Industries, Inc.
   c. NIBCO, Inc.
   d. Viega, LLC.
2. Housing: Copper
3. O-Rings and Pipe Stops: EPDM.
4. Tools: Manufacturer's special tools.
5. Minimum 200 psig working pressure rating at 250°F.

F. Wrought-Copper Unions: ASME B16.22.

2.4 PLASTIC PIPE AND FITTINGS

A. CPVC Plastic Pipe: ASTM F 441/F 441M, with wall thickness as indicated in "Piping Applications" Article.
   1. CPVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe.

B. PVC Plastic Pipe: ASTM D 1785, with wall thickness as indicated in "Piping Applications" Article.
   1. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.

2.5 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

F. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for CPVC Piping: ASTM F 493.

H. Solvent Cements for PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.6 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:
   1. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.

B. Plastic-to-Metal Transition Unions:
   1. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

2.7 DIELECTRIC FITTINGS

A. Where piping of dissimilar metals is joined together use yellow brass unions.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Type K annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.

B. Condensate-Drain Piping: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints or Schedule 40 PVC or CPVC plastic pipe and fittings with solvent-welded joints.
   1. Exceptions where PVC, CPVC, and other forms of plastic are not permitted:
      a. Jails/Prisons.
      b. Plenums.
      c. Locations prohibited by codes or standards.

C. Air-Vent Piping:
   1. Inlet: Same as service where installed.
   2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

D. Safety-Valve-Inlet and -Outlet Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed.

E. Miscellaneous: Same materials and joining methods as connecting service.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved in writing on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and 8" NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

O. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

P. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

Q. Install all wells, valves, taps, flow stations, etc. furnished under Section "Building Automation System."

R. Install exterior piping at a uniform grade of 0.2 percent upward in direction of flow. Interior piping may be installed level.

S. Install condensate drain piping at a minimum uniform slope of 1" in 10'-0"in the direction of flow.

T. Reduce pipe sizes using concentric reducers, or eccentric reducers installed with level side up.

U. Provide branch connections with the takeoff coming off the top of the main.

V. Install strainers on supply side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and as indicated. Install 3/4" diameter by 8" long nipple and ball valve in blowdown connection of strainers 3/4" and larger. Match size of strainer blow-down connection for strainers smaller than 3/4".

W. Provide seal around piping penetrations of full height interior walls, both rated and non-rated, that occur above ceilings. Refer to Section 079200 Joint Sealants.

X. Where piping penetrates a non-fire-resistance-rated floor or floor/ceiling assembly or ceiling membrane of a non-fire-resistance-rated roof/ceiling assembly, provide the following:

1. For noncombustible piping that connects not more than five stories, protect the annular space around the piping with an approved, noncombustible material to resist the free passage of flame and the products of combustion or with a tested and classified through-penetration firestop system.
2. For piping that connects not more than two stories, protect the annular space around the piping with an approved, noncombustible material to resist the free passage of flame and the products of combustion.
3. For piping that penetrates a non-rated wall, protect the annular space around the penetrating piping with an approved, non-combustible materials that resists the free passage of flame and the products of combustion.

3.3 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are damaged.
   3. Damaged Welds: Do not use pipe sections that have cracked or open welds.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports." Comply with requirements below for maximum spacing of supports.

B. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
   1. ¾": Maximum span, 7'-0"; minimum rod size, ¼".
   2. 1": Maximum span, 7'-0"; minimum rod size, ¼".
   3. 1½": Maximum span, 9'-0"; minimum rod size, 3/8".
   4. 2": Maximum span, 10'-0"; minimum rod size, 3/8".

5. 2½": Maximum span, 11'-0"; minimum rod size, 3/8".
6. 3": Maximum span, 12'-0"; minimum rod size, 3/8".
7. 4": Maximum span, 14'-0"; minimum rod size, ½".
8. 6": Maximum span, 17'-0"; minimum rod size, ½".
9. 8": Maximum span, 19'-0"; minimum rod size, 5/8".
10. 10": Maximum span, 20'-0"; minimum rod size, ¾".
11. 12": Maximum span, 23'-0"; minimum rod size, 7/8".
12. 14": Maximum span, 25'-0"; minimum rod size, 1".
13. 16": Maximum span, 27'-0"; minimum rod size, 1".
14. 18": Maximum span, 28'-0"; minimum rod size, 1¼".
15. 20": Maximum span, 30'-0"; minimum rod size, 1¼".

C. Where hangers for steel piping are to be suspended from open-web steel joists, install hangers at maximum spacing that will result in hanger loads that comply with the requirements on the structural drawings.

D. Install hangers for copper piping with the following maximum spacing and minimum rod sizes:
1. ¾": Maximum span, 5'-0"; minimum rod size, ¼".
2. 1": Maximum span, 6'-0"; minimum rod size, ¼".
3. 1½": Maximum span, 8'-0"; minimum rod size, 3/8".
4. 2": Maximum span, 8'-0"; minimum rod size, 3/8".
5. 2½": Maximum span, 9'-0"; minimum rod size, 3/8".
6. 3": Maximum span, 10'-0"; minimum rod size, 3/8".

E. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

F. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 Where changes in direction or tees occur, place hangers 1/3 of the maximum allowed spacing distance from the change in direction or tee (i.e. if the maximum span is 12 feet, the hanger shall be 4feet from the change in direction or tee). Pipe shall be supported from both sides of a change in direction.

3.6 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during testing.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush system with clean water. Clean strainers.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release trapped air. Use drains installed at low points for complete draining of liquid.
3. Check expansion tanks to determine that they are not air bound and that system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test.
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

3.7 ADJUSTING

A. Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

B. Perform these adjustments before operating the system:
   1. Open valves to fully open position. Close coil bypass valves.
   2. Check pump for proper direction of rotation.
   3. Set automatic fill valves for required system pressure.
   4. Check air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
   5. Set temperature controls so all coils and equipment are calling for full flow.
   6. Check and set equipment operating temperatures to design requirements.
   7. Lubricate motors and bearings.

3.8 CLEANING

A. Remove and clean or replace strainer screens. After cleaning and flushing hydronic piping systems, but before balancing, remove disposable fine-mesh strainers.

END OF SECTION 232113

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated for the following:
   1. Thermostatic expansion valves.
   2. Solenoid valves.
   3. Hot-gas bypass valves.
   4. Filter dryers.
   5. Strainers.
   6. Pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, slopes of horizontal runs, oil traps, double risers, valve arrangements & locations wall & floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
   1. Shop Drawing Scale: ¼"=1'-0"
   2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, proposed equipment, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.3 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX; "Welding and Brazing Qualifications."

B. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."

D. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical"; or UL 429, "Electrically Operated Valves."

1.5 COORDINATION

A. Coordinate layout and installation of refrigerant piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate pipe sleeve installations for wall penetrations.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

D. Coordinate pipe sleeve installations for penetrations in exterior walls and floor assemblies. Coordinate with requirements for firestopping.

E. Coordinate pipe fitting pressure classes with products specified in related Sections.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8, BCuP series, copper-phosphorus alloys for general duty brazing unless otherwise indicated. AWS A5.8, BAg-5 silver alloy for refrigerant piping unless otherwise indicated.

F. Flexible Connectors:
1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum ¾" misalignment in minimum 7" length.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; Type, Grade, and wall thickness as selected in Part 3 piping applications articles.

B. Wrought-Steel Fittings: ASTM A 234/A 234M, for welded joints.

C. Steel Flanges and Flanged Fittings: ASME B16.5, steel, including bolts, nuts, and gaskets, bevel-welded end connection, and raised face.

D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Flanged Unions:
1. Body: Forged-steel flanges for 1" to 1 ½" and ductile iron for 2" to 3". Apply rust-resistant finish at factory.
2. Gasket: Fiber asbestos free.
3. Fasteners: Four plated-steel bolts, with silicon bronze nuts. Apply rust-resistant finish at factory.
4. End Connections: Brass tailpiece adapters for solder-end connections to copper tubing.
5. Offset Performance: Capable of minimum ¾" misalignment in minimum 7" length.
6. Pressure Rating: Factory test at minimum 400 psig.
7. Maximum Operating Temperature: 330 deg F.

F. Flexible Connectors:
1. Body: Stainless-steel bellows with woven, flexible, stainless-steel-wire-reinforced protective jacket
2. End Connections:

a. NPS 2 and Smaller: With threaded-end connections.
b. NPS 2-1/2 and Larger: With flanged-end connections.

3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:
1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. End Connections: Socket, union, threaded, or flanged.
6. Maximum Opening Pressure: 0.50 psig.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 or UL 429.
1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24, 115, or 208-V ac coil to meet requirements of control system.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.

4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Superheat: Adjustable.
7. Reverse-flow option for heat-pump applications.
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 450 psig.

H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. Equalizer: Internal or External.
7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24, 115, or 208-V ac coil to meet requirements of control system.
8. End Connections: Socket.
9. Throttling Range: Maximum 5 psig.
10. Working Pressure Rating: 500 psig.
11. Maximum Operating Temperature: 240 deg F.

I. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

J. Angle-Type Strainers:
1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

K. Moisture/Liquid Indicators:
1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

L. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.

2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.
4. Designed for reverse flow when used in for heat-pump applications.
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Rated Flow: Match equipment.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

M. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.
4. Designed for reverse flow where heat-pump applications are indicated.
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig Insert value.
8. Rated Flow: Match equipment.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

N. Mufflers:
1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

O. Receivers: Comply with ARI 495.
1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

P. Liquid Accumulators: Comply with ARI 495.
1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.4 REFRIGERANTS

A. Available Manufacturers:
1. Atofina Chemicals, Inc.

2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-454B: Difluoromethane / 2,3,3,3-Tetrafluoropropene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT

A. Suction Lines 1 ½" and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Suction Lines 2" to 4" for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

C. Hot-Gas, and Liquid Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

D. Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

E. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints or soldered joints or Schedule 40, black-steel and wrought-steel fittings with welded joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless, or packed-angle valves in suction and discharge lines of compressors.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of proposed equipment.

C. Install a check valve at the compressor discharge and a liquid accumulator. Locate at the compressor suction connection between the compressor and service valve.

D. Unless indicated otherwise, install valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve on systems with multiple thermostatic expansion valves. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
1. Install valve so diaphragm case is warmer than bulb.

2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line. Verify proper location with Equipment Manufacturer.
3. Where external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following:
1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

L. Install receivers sized to accommodate pump-down charge.

3.3 VALVE APPLICATIONS

3.4 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless or packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve on systems with multiple thermostatic expansion valves. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Verify proper location for bulb with valve manufacturer. Don't mount bulb in a trap or at bottom of line.

3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at inlet of the thermostatic expansion valve or at inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished with equipment:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryer in liquid line between compressor and thermostatic expansion valve.

L. Install filter dryer in the suction line at the compressor.

M. Install receivers sized to accommodate pump-down charge.

3.5 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, & packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Section "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section "Sleeves and Sleeve Seals for HVAC Piping."

T. Install sleeve seals for piping penetrations of exterior walls and floor slabs. Comply with requirements for sleeve seals specified in Section "Sleeves and Sleeve Seals for HVAC Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section "Escutcheons for HVAC Piping."

3.6 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.

I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.7 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20'-0" long.
2. Roller hangers and spring hangers for individual horizontal runs 20'-0" or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20'-0" or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. ½": Maximum span, 60"; minimum rod size, ¼".
2. 5/8": Maximum span, 60"; minimum rod size, ¼".
3. 1": Maximum span, 72"; minimum rod size, ¼".
4. 1 ¼": Maximum span, 96"; minimum rod size, 3/8".
5. 1 ½": Maximum span, 96"; minimum rod size, 3/8".

6. 2": Maximum span, 96"; minimum rod size, 3/8".
7. 2 ½": Maximum span, 108"; minimum rod size, 3/8".
8. 3": Maximum span, 10'-0"; minimum rod size, 3/8".
9. 4": Maximum span, 12'-0"; minimum rod size, ½".

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. 2": Maximum span, 10'-0"; minimum rod size, 3/8".
2. 2 ½": Maximum span, 11'-0"; minimum rod size, 3/8".
3. 3": Maximum span, 12'-0"; minimum rod size, 3/8".
4. 4": Maximum span, 14'-0"; minimum rod size, ½".

E. Support multifloor vertical runs at least at each floor.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.9 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.10 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Seal all ducts to seal class A as defined in SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005:

1. Seal all longitudinal joints.
2. Seal all transverse joints.
3. Seal all penetrations.

B. Seal Class: A

C. Test pressure:

1. 3.0" WC for round and flat oval duct.
2. 3.0" WC for rectangular duct.

D. Testing: Leak test all medium pressure ductwork (upstream from VAV boxes to outlet of VAV AHU-1)

E. Duct Construction: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" and performance requirements and design criteria indicated in "Duct Schedule" Article.

F. Liner Airstream Surfaces: Liner surfaces in contact with the airstream shall comply with ASHRAE 62.1-2007, paragraph 5.5.

G. CLEANLINESS: All factory fabricated duct shall be cleaned with a non-toxic, biodegradable cleaner/degreaser and shall be shrink wrapped prior to shipment.

H. Structural Performance: Seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Fourth Edition 2020 and ASCE/SEI 7.

1.3 ABBREVIATIONS

A.	BAS	Building Automation System
B.	NRTL	Nationally Recognized Testing Laboratory
C.	SMACNA	Sheet Metal and Air conditioning Contractors' National Association
D.	WC	Water Column

1.4 DEFINITIONS:

A. Duct System: For the purposes of this section "duct system" shall mean all metal supply, return, and exhaust duct and fittings between the air moving device and the space.

B. Low Pressure: Plus two (2.0) inches WC to minus one (1.0) inches WC

C. Medium Pressure: More than two (2.0) inches WC to plus ten (10.0) inches WC or more than minus one (1.0) inch to minus ten (10.0) inches WC

D. High Pressure: More than plus or minus ten (10.0) inches WC.

1.5 SUBMITTALS

A. Product Data / Documentation: For each of the following:

1. Sheet metal thicknesses.
2. Liners and adhesives.
3. Pre-manufactured ductwork.
4. Sealants and gaskets.
5. Statement of duct seal class. Describe how it will be achieved.
6. VOC content for adhesives and sealants.
7. Seismic-restraint devices.

B. CAD-generated Shop Drawings:

1. Show fabrication and installation details for metal ducts.
2. 1/4"=1'-0" scale minimum including duct layout indicating sizes and pressure classes for the following areas:
    a. Areas indicated on the drawings at 1/4"=1'-0" scale.
    b. Areas where sections are cut.
    c. Finished spaces with exposed ductwork.
        1) Exceptions:
            a) Janitors closets
            b) Storage Rooms
            c) Receiving Areas
        2) Include:
            a) Plans, elevations and sections.
            b) Elevations of top and bottom of ducts.
            c) Dimensions of main duct runs from building grid lines.
3. 3/4"=1'-0" scale minimum for the following:
    a. Hangers and supports, including methods for duct and building attachment, vibration isolation and seismic restraints.
    b. Duct accessories, including access doors and panels.
    c. Equipment installation based on approved equipment submittals.
    d. Penetrations through fire-rated and other partitions.
    e. Fittings.
    f. Components.
4. 3"=1'-0" scale minimum for the following:
    a. Seam and joint construction.
    b. Reinforcement and spacing.

c. Fabrication including attachments to other work.
d. Trapeze Hangers.
e. Mockups may be provided in lieu of 3"= 1'-0" details. Notify Architect in writing if mock-ups will be provided

C. Submittals during construction:

1. Leakage Test Report: Documentation of work performed for compliance with ASHRAE/IESNA 90.1-2007, Section 6.4.4.2.2 - "Duct Leakage Tests."
2. Duct-Cleaning Test Report: Documentation of work performed for compliance with ASHRAE 62.1-2007, Section 7.2.4 - "Ventilation System Start-Up."

1.6 QUALITY ASSURANCE

A. Provide work in compliance with applicable Building Code requirements.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

C. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

D. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.

E. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

F. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

G. ASHRAE/IESNA Compliance: Comply with applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6.4.4 - "HVAC System Construction and Insulation."

H. Mockups (Contractor's option in lieu of 3"=1'-0" details):

1. Before installing duct systems, build mockups. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
2. Three transverse joints.
3. One Reinforced section with 3 reinforcements.
4. One of each type; attachments to other work.
5. Two typical flexible duct or flexible-connector connections.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 2-1, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 2-2, "Rectangular Duct/Longitudinal Seams" for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

2.2 LOW PRESSURE SINGLE-WALL ROUND DUCTS AND FITTINGS –CONCEALED

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 3, "Round, Oval, and Flexible Duct," based on specified static-pressure class unless otherwise indicated.

B. Snap Lock Round Pipe with External Duct Sealant

1. Provide ASTM A653 hot-dipped, galvanized steel sheet, 26 gauge, G-60 coating. Product shall meet pressure rating of -1" wg to +2" wg.
2. Comply with SMACNA Class 3 Leakage standards and SMACNA Seal Class A with external, field-applied, mastic duct sealant.

C. Snap Lock Round Pipe with Factory Duct Seal

1. Available Manufacturers:
   a. GreenSeam Industries - GreenSeam Plus
2. Provide ASTM A653 hot-dipped, galvanized steel sheet, 26 gauge, G-60 coating. Product shall meet pressure rating of -1" wg to +2" wg.
3. Comply with SMACNA Class 3 Leakage standards and SMACNA Seal Class A with transverse and longitudinal seams sealed with factory-provided EPDM rubber and co-polymer gaskets.

D. Manufacturers:

1. Eastern Sheet Metal.
2. Hamlin Sheet Metal.
3. Linx Industries - Lindab.
4. McGill AirFlow LLC.
5. MKT Metal Manufacturing
6. Semco, Inc.
7. Sheet Metal Connectors, Inc.
8. Spiral Manufacturing Co., Inc.

E. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-1, "Round Duct Transverse Joints"

1. Transverse Joints in Ducts Equal to or Larger Than 48" in Diameter: Flanged.
2. Gasketed, EPDM, self sealing Joints such as Eastern Tight or Spiro Safe may be used for ducts smaller than 48" in diameter.

3. Flanges may be substituted in ducts smaller than 48" in diameter.

F. Duct support intervals, and other provisions: In accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

G. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-2, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

H. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-5, "90º Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005." Adjustable elbows are not permitted.

I. Adjustable elbows shall not be used.

J. All round duct shall not be less than No. 26 U.S. gauge.

2.3 MEDIUM PRESSURE SINGLE-WALL ROUND AND FLAT OVAL DUCTS AND FITTINGS –CONCEALED

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Manufacturers:

1. Eastern Sheet Metal.
2. Hamlin Sheet Metal.
3. Linx Industries - Lindab.
4. McGill AirFlow LLC.
5. MKT Metal Manufacturing
6. Semco, Inc.
7. Sheet Metal Connectors, Inc.
8. Spiral Manufacturing Co., Inc.

C. Flat-Oval Ducts: Dimensions are the inside duct width (major dimension) and inside diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-1, "Round Duct Transverse Joints"

1. Transverse Joints in Ducts Equal to or Larger Than 48" in Diameter: Flanged.
2. Gasketed, EPDM, self sealing Joints such as Eastern Tight or Spiro Safe may be used for ducts smaller than 48" in diameter.
3. Flanges may be substituted in ducts smaller than 48" in diameter.

E. Duct support intervals, and other provisions: In accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

F. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

G. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-5, "90º Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005." Adjustable elbows are not permitted.

H. Adjustable elbows shall not be used.

I. All seam types in Figure 3-2 are acceptable where approved by SMACNA.

J. All round duct shall not be less than No. 26 U.S. gauge.

2.4 LOW PRESSURE SINGLE-WALL ROUND DUCTS AND FITTINGS -EXPOSED

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 3, "Round, Oval, and Flexible Duct," "FIGURE 3-2 ROUND DUCT LONGITUDINAL SEAMS" "SPIRAL SEAM RL-1" to plus-or-minus 10" WC unless otherwise indicated.

B. Manufacturers:

1. Eastern Sheet Metal.
2. Hamlin Sheet Metal.
3. Linx Industries - Lindab.
4. McGill AirFlow LLC.
5. MKT Metal Manufacturing
6. Semco, Inc.
7. Sheet Metal Connectors, Inc.
8. Spiral Manufacturing Co., Inc.

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-1, "Round Duct Transverse Joints"

D. Static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005." And the following:

1. Transverse Joints in Ducts Equal to or Larger Than 48" in Diameter or Flat Oval with a Major Dimension Equal to or Larger Than 48": Flanged.
2. Gasketed, EPDM, self sealing Joints such as Eastern Tight or Spiro Safe may be used for ducts smaller than 48" in diameter.
3. Flanges may be substituted in ducts smaller than 48" in diameter.

E. Longitudinal Seams: Duct shall be spiral according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-2, " Round Duct Longitudinal Seams"

F. Tees and Laterals: Tees and laterals shall be created with fittings. Fabricate fittings according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005." Adjustable elbows are not permitted.

G. Static-pressure class: Applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

H. Adjustable elbows shall not be used.

I. Longitudinal seams shall be spiral type.

J. All round duct shall not be less than No. 26 U.S. gauge.

2.5 DOUBLE-WALL ROUND DUCTS AND FITTINGS (PERFORATED LINER)

A. Manufacturers:

1. Eastern Sheet Metal.
2. Hamlin Sheet Metal.
3. Linx Industries - Lindab.
4. McGill AirFlow LLC.
5. MKT Metal Manufacturing
6. Semco, Inc.
7. Sheet Metal Connectors, Inc.
8. Spiral Manufacturing Co., Inc.

B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

1. Transverse Joints in Ducts Equal to or Larger Than 48" in Diameter or Flat Oval with a Major Dimension Equal to or Larger Than 48": Flanged.
2. Gasketed, EPDM, self sealing Joints such as Eastern Tight or Spiro Safe may be used for ducts smaller than 48" in diameter.
3. Flanges may be substituted in ducts smaller than 48" in diameter.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-2, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005, Third Edition 2005."

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-5, "90º Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005."

F. Inner Duct: Minimum 24-gauge perforated galvanized sheet metal steel having 3/32-inch diameter perforations with overall open area of 23 percent.

G. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
2. Coat insulation with antimicrobial coating.
3. Cover insulation with polyester or Mylar film complying with UL 181, Class 1.

H. All round duct shall not be less than No. 26 U.S. gauge.

2.6 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.7 DUCT LINER

A. For double wall duct: Not required. All other duct: Provide where indicated.

B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B. Foam shall contain or be coated with EPA-approved or EPA-registered antimicrobial additive or paint.

1. Manufacturers:

a. Aeroflex USA, Inc.
b. Armacell LLC.
c. K-Flex USA.

2. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at75 deg F mean temperature when tested according to ASTM C 518.

3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

C. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

D. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

E. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.8 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723.

1. Materials: Certified by a NRTL.

2. Adhesive and sealant products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario. The default scenario is the private office scenario. The manufacturer's or third-party certification must state the exposure scenario used to determine compliance. Claims of compliance for wet-applied products must state the amount applied in mass per surface area. Manufacturers' claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1:
   a. 0.5 mg/m3 or less;
   b. between 0.5 and 5.0 mg/m3; or
   c. 5.0 mg/m3 or more

AND all adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168. The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.

B. Tape sealing systems are not permitted.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
10. Indoor applications: Sealant with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
12. Service: Indoor or outdoor.
13. Substrate: Compatible with galvanized sheet steel, stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. Indoor applications: Sealant with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.9 HANGERS AND SUPPORTS

A. Hanger Rods: Galvanized, all-thread.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.10 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Ductmate Industries, Inc.
3. Hilti Corp.
4. Kinetics Noise Control.
5. Mason Industries.
6. TOLCO; a brand of NIBCO INC.
7. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.11 RESIDENTIAL DRYER VENTING ACCESSORIES

A. Dryer Vent Wall Box: In-wall receptacle to house dryer transition duct.

1. In-O-Vate Technologies, Inc. – Dryerbox
2. American Aldes – Dryer vent box
3. Lambro Industries, Inc. – Dryer wall box
4. Construction Solutions, LLC. – Dryer vent box.
5. Approved equal.

B. Dryer Transition Duct: Provide UL 2158A-listed product.

1. In-O-Vate Technologies, Inc.
2. QuietFlex Manufacturing Co, LP
3. Lambro Industries, Inc.
4. Flexible Technologies, Inc. – Thermaflex
5. Approved equal.

C. Dryer Vent Long Radius Elbows:

1. In-O-Vate Technologies, Inc. – Dryer-Ell
2. Approved equal for long radius elbows for dryer vent.

D. Wall Vent: Galvanized steel body with backdraft damper. Paint or provide color to match wall.

1. In-O-Vate Technologies, Inc. – Dryer Wall Vent
2. American Aldes – Standard Dryer Wall Hood
3. Approved equal for dryer vent terminations through exterior walls.

E. Roof Vent: Galvanized steel body with backdraft damper.

1. In-O-Vate Technologies, Inc. – Dryer Jack
2. American Aldes - Dryer Roof Cap
3. Approved equal for dryer vent terminations through roofs.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved by Architect in writing.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" unless otherwise indicated.

C. Install ducts with fewest possible joints.

D. Install factory-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically or horizontally, and parallel or perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Maintain clearances for equipment maintenance.

G. Install ducts with a clearance of 1 inch, plus allowance for installation of insulation at specified thickness.

H. Do not route ducts through transformer vaults, electrical equipment rooms, elevator equipment rooms or electrical enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Provide fire dampers where ducts pass through fire-rated interior partitions, fire-rated exterior walls, fire-rated floor assemblies, or fire-rated shaft enclosures.

K. Protect duct interiors from moisture, construction debris, dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 PROTECTION OF WALL AND FLOOR PENETRATIONS OF NON-RATED ASSEMBLIES

A. Where ducts penetrate non-fire-resistance-rated wall or floor assemblies, protect the penetration with one of the following:

1. For a duct that connects not more than two stories vertically, protect the annular space around the penetrating duct with an approved, noncombustible material that resists the free passage of flame and the products of combustion.
2. For a duct that connects not more than three stories, protect the annular space around the penetrating duct with an approved, noncombustible material that resists the free passage of flame and the products of combustion and a fire damper at each floor line.
3. For ducts that penetrate a smoke partition without a smoke damper, protect the annular space around the penetrating duct with an approved, non-combustible materials that resists the free passage of flame and the products of combustion.
4. For ducts that penetrate a non-rated wall, protect the annular space around the penetrating duct with an approved, non-combustible materials that resists the free passage of flame and the products of combustion.

3.3 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding. Do not weld or grind lined ductwork.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of duct, fittings, hangers, supports, accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.4 INSTALLATION OF CLOTHES DRYER EXHAUST DUCTS

A. Clothes dryer exhaust ducts shall terminate outside the building and shall include a backdraft damper. Screens are not acceptable. Ducts shall terminate not less than 3 feet in any direction from openings into buildings including ventilated soffits.

B. Ducts shall not extend into or through ducts or plenums. Where a duct penetrates a wall or ceiling membrane, the annular space shall be sealed with non-combustible material, approved fire caulking, or a non-combustible dryer exhaust duct wall receptacle. Ducts shall not include any type of damper.

C. Ducts shall have a smooth interior finish and shall be metal not less than 0.016 inch in thickness.

D. Ducts shall not be connected or installed with sheet metal screws or other fasteners that will obstruct airflow or accumulate lint. Provide a means of cleanout at each vertical riser other than the transition duct at the dryer connection. Duct size shall not reduce from connection size.

E. Provide protective shield plates where nails or screws from finish or other work are likely to penetrate the duct. Provide shield plates on finished face of framing members where there is less than 1-1/4" between the duct and finished face of the framing member. Shield plates shall be steel, have a thickness of 0.062 inch, and extend not less than 2 inches above sole plates and below top plates.

F. Duct joints, seams, and connections shall be sealed with mastics or tapes. Tapes and mastics used on metallic duct shall comply with UL 181B and shall be marked "181 B-C." All sealing measures shall be installed in accordance with the manufacturer's instructions.

G. Domestic Clothes Dryer Ducts:

1. Ducts shall be supported at 4 foot intervals and secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow.
2. Duct size shall be 4 inch in diameter or larger.
3. Duct equivalent length shall be less than 35 feet. If equivalent length exceeds 35 feet, provide a copy of appliance's installation instructions for make and model of dryer for review by authority having jurisdiction. Where duct is to be concealed, provide installation instruction to authority having jurisdiction prior to concealment inspection. Where the exhaust duct equivalent length exceeds 35 feet, the equivalent length of the exhaust duct shall be identified on a permanent label or tag located within 6 feet of the exhaust duct connection.

H. Commercial Clothes Dryer Ducts:

1. Installation shall comply with the appliance manufacturer's installation instructions.
2. Ducts shall have a minimum clearance of 6 inches to combustible materials.
3. Transition ducts shall not exceed 8 feet in length and shall be listed and labeled for the application. Transition ducts shall not be concealed within construction.

3.5 DUCT SEALING

A. Seal all ducts to seal class A as defined in SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005:

1. Seal all longitudinal joints.
2. Seal all transverse joints.
3. Seal all penetrations.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Chapter 5, "Hangers and Supports."

B. Building Attachments: Unless indicated otherwise, provide concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Do not use powder-actuated concrete fasteners for lightweight-aggregate concrete or for slabs less than 4 inches thick.
3. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and channel supports.

E. Support vertical ducts with channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor or at a maximum intervals of 18 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.7 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Design hangers and braces to support the duct and to restrain against seismic forces required by applicable building codes. Comply with ASCE/SEI 7 and brace changes of direction longer than 12 feet.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

F. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, and grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Install heavy-duty sleeve anchors with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.8 CONNECTIONS

A. Make connections to equipment with flexible connectors.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005" for branch, outlet, inlet, and terminal unit connections unless otherwise indicated.

3.9 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply two coats of flat black, latex paint over a compatible galvanized-steel primer.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Visually inspect, for proper seal application, all ductwork not tested prior to insulation application. Prepare inspection report.

C. Leakage Test. Test ducts with operational pressures greater than 3" WC.

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Prepare a report for each test.
2. Test ducts, disassemble, reassemble, reseal, and retest until leakage class 3 (as defined in SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005) is achieved.
3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested.
6. Give seven days' advance notice to Architect and Owner for testing.

D. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present. If visible contaminants are visible, proceed to sub-paragraph 2 below. If not, no further cleaning shall be required.

2. Test sections of metal duct systems, up to one location per ten thousand (10,000) square feet of building area, or a minimum of two (2) per system, whichever is greater, chosen randomly by the Owner's Representative, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems." Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm. Cut hole in duct and install access door at each location selected. Size shall be as indicated in division 23 section "AIR DUCT ACCESSORIES."
3. Duct system shall be considered dirty and in need of cleaning if any test location does not pass the cleanliness test. Cleaning shall be performed in accordance with this specification.

E. Prepare and submit test and inspection reports.

3.11 DUCT CLEANING

A. Clean new duct systems before testing, adjusting, and balancing.

B. Use duct cleaning methodology as indicated in NADCA ACR.

C. Use service openings for entry and inspection.

1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

D. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

E. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.

7. Dedicated exhaust and ventilation components and makeup air systems.

F. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

G. Repeat the duct cleanliness tests as required in Section above until a duct cleanliness level of "C" (advanced level) is achieved.

3.12 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.13 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Ducts Connected Serving Locker Rooms, Shower Rooms, and Team Rooms:

1. Aluminum sheet.
2. Exposed to View: Bright finish.
3. Concealed: Mill finish.

C. Double-Wall Duct Interstitial Insulation (where indicated):

1. Supply Air Ducts: 1" thickness.

D. Transfer Duct Liner (where indicated): 1" thickness.

E. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 4-2, "Rectangular Elbows."

a. Velocity less than 1500 fpm or lower:

1) Radius Type RE 1. Centerline radius = 3W/2.

2) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
3) Transfer ducts indicated with mitered elbows do not require turning vanes.

b. Velocity 1500 fpm or Higher:

1) Radius Type RE 3. Centerline radius = 3w/2 and three vanes.
2) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-4, "Round Duct Elbows."

a. Minimum centerline radius-to-diameter ratio shall be 1.5 with a maximum of 5 Elbow Segments. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Table 3-1, "Mitered Elbows." Elbows with less than a 90 degree change of direction shall have segments per Table 3-1 in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005".
b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped, segmented, spiral or pleated. Adjustable elbows not acceptable.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam, segmented, or spiral.

3. Flat Oval Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-7, "Flat Oval Ducts" for elbows.

F. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 4-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Conical or bellmouth. No flanged or spin-in fittings permitted.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005," Figure 3-6, "Conical Tees."

a. Medium Pressure Round or Flat Oval to Branch:

1) 45° Lateral wye.
2) To flat oval branch: 90° Tee fittings with 45° boot to flat oval tap.
3) To round branch: 90° Tee fittings with 45° boot to round tap.
4) 90° Conical tap.

b. Low Pressure Round Main to Round Branch:

1) Conical saddle taps.
2) Conical fittings.
3) 45° Lateral saddle taps.
4) 45° Lateral fittings.

c. No 90° taps or 90° saddle taps permitted.

G. Divided Flow Branches:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible, Third Edition 2005, "Figure 4-5 Divided Flow Branches."

3.14 Duct Pressure Classes:

A. Supply ducts from air handling units to terminal units (VAV boxes): 3 inches WC.

B. Return ducts from RTU-1: 2 inch WC.

C. Supply ducts from air handling units to air terminals: 1 inch WC.

D. Return ducts other than RTU-1: 1 inch WC.

E. Supply ducts from terminal units (VAV boxes) to air terminals: 1 inch WC.

F. Exhaust ducts: 1 inch WC.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Radius forming braces
2. Volume dampers.
3. Flange connectors.
4. Turning vanes.
5. Duct-mounted access doors.
6. Flexible connectors.
7. Flexible ducts.
8. Duct security bars.

B. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

C. Comply with SMACNA standards for manual airflow regulators (dampers).

1.4 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed. Minimum 1 of each type used.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable duct installation methods unless otherwise indicated.

C. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90
2. Exposed-Surface Finish: Mill phosphatized.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a NO 2 finish for concealed ducts and NO 4 finish for exposed ducts.

E. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

F. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

G. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

H. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches; compatible materials for aluminum and stainless-steel ducts.

2.2 RADIUS FORMING BRACES

A. Available manufacturers:

1. Titus, FlexRight (Basis of Design)
2. Flexible Technologies, Inc., Thermaflex Division, FlexFlow
3. Hart & Cooley, Smart Flow Elbow

B. General: UL-2043 listed or NRTL approved product constructed of metal or plastic manufactured for use with flexible duct to form a kink free elbow using the flexible duct. Any flexible duct used in forming the elbow shall be included in the maximum permitted length. Resulting flexible duct shall comply with SMACNA HVAC Duct Construction Standards.

C. Duct Size: 6" through 16" in diameter.

D. Inside (Bend) Radius: Minimum of one duct diameter along centerline.

E. Attachments: Plastic zip ties or stainless steel worm gear clamps.

F. Support to Overhead: Shall meet SMACNA requirements. Use of specified attachments for support shall not be permitted.

2.3 MANUAL VOLUME DAMPERS

A. Steel, Manual Volume Dampers:

1. Manufacturers:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Elgen Manufacturing.
d. Greenheck Fan Corporation.
e. GSI – A DMI Company – GreenSeam Industries.
f. McGill AirFlow LLC.

g. Nailor Industries.
h. PCI Industries – Pottorff.
i. Ruskin Company.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Hat-shaped, 0.094-inch thick galvanized or 0.05-inch stainless-steel, match duct material.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized or stainless-steel channels, match duct material.

6. Blade Axles: Galvanized steel or stainless steel. Dampers over 12" width/diameter shall include continuous axles. Dampers 12" and less may have non-continuous axles. Comply with SMACNA HVAC Duct Construction Standards Metal and Flexible – Third Edition Figure 7-4.

7. Bearings:

a. Molded synthetic. Provide bearing at both duct wall penetrations.

8. Tie Bars and Brackets: Galvanized steel.

B. Aluminum, Manual Volume Dampers:

1. Manufacturers:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Elgen Manufacturing.
d. Greenheck Fan Corporation.
e. GSI – A DMI Company – GreenSeam Industries
f. McGill AirFlow LLC.
g. Nailor Industries.
h. PCI Industries - Pottorff
i. Ruskin Company.

2. Standard leakage rating, with linkage and operator outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped aluminum channels for installing in ducts.
5. Blades:

a. Multiple or single blade.

b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Roll Formed or Extruded Aluminum.
e. Blade Axles: Galvanized steel or Stainless steel. Dampers over 12" width/diameter shall include continuous axles. Dampers 12" and less may have non-continuous axles. Comply with SMACNA HVAC Duct Construction Standards Metal and Flexible – Third Edition Figure 7-4.

6. Bearings:

a. Molded synthetic. Provide bearing at both duct wall penetrations.

7. Tie Bars and Brackets: Aluminum.

C. Damper Hardware:

1. Zinc-plated, die-cast manual quadrant kit with dial and handle made of zinc plated steel, and a hexagon lock nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform or stand-off for insulated duct mounting.

2.4 FLANGE CONNECTORS

A. Available Manufacturers:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Match connecting ductwork.

D. Gauge: 18, 20, or 24 as recommended by manufacturer or match connecting ductwork.

2.5 MANUFACTURED TURNING VANES

A. Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

C. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.6 DUCT-MOUNTED ACCESS DOORS

A. Available Manufacturers:

1. Ductmate Industries, Inc.
2. Flexmaster U.S.A., Inc.
3. Greenheck Fan Corporation.
4. Kees

5. McGill AirFlow LLC.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:
   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
   d. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
   a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
   d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.7 FLEXIBLE CONNECTORS

A. Do not use on smoke control/management fans. Install on all other fans and fan equipped units even when provided with internal isolation.

B. Available Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Corporation.
3. Ventfabrics, Inc.
4. Hart & Cooley, Inc.

C. Materials: Flame-retardant or noncombustible fabrics.

D. Coatings and Adhesives: Comply with UL 181, Class 1.

1. Adhesive products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario. The default scenario is the private office scenario. The manufacturer's or third-party certification must state the exposure scenario used to determine compliance. Claims of compliance for wet-applied products must state the amount applied in mass per surface area. Manufacturers' claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1:
   a. 0.5 mg/m3 or less;
   b. between 0.5 and 5.0 mg/m3; or
   c. 5.0 mg/m3 or more

   AND all adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168. The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations

E. Connector: Factory fabricated with a fabric strip 3½ to 4½ inches wide attached to 2 strips of 2½ to 4½ inches wide, 23 to 25 gauge "0.0269 to .0209 inch thick" galvanized sheet steel, stainless sheet steel, or aluminum sheets. Provide metal compatible with connected ducts.

F. Indoor System, Flexible Connector Fabric: Glass fabric double-coated with neoprene.

1. Minimum Weight: 26 oz/sq yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

G. Outdoor System, Flexible Connector Fabric: Glass fabric double-coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz/sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

H. Thrust Limiters:

1. Field fabricated cable restraints on equipment producing greater than 4.0" WC of positive pressure.
2. Field fabricated cable restraints as detailed. If not detailed; Provide restraint consisting of a 1/16 inch diameter vinyl coated steel cable at 24" maximum on center, attached to flange bolts on each side of flexible connector. Cable length shall be such that, when in tension, ½" of movement in the flexible connection is preserved. If flanges are not used, contractor may provide steel, stainless steel, or aluminum angles for attaching cables. Match duct material. Cables shall attach to screw or fastener holding angle to duct and shall be routed through a 3/16" diameter hole in the bracket offset approximately 1" from duct.
3. Direction of connector movement: Parallel with airflow, perpendicular to connector.

2.8 FLEXIBLE AIR DUCTS

A. Manufacturers:

1. Flexmaster U.S.A., Inc. (Basis of design, Provide Type 1M)
2. Thermaflex
3. Hart & Cooley, Inc.

B. Provide bead on connecting duct for sizes greater than 12" in diameter.

C. Insulated, Flexible Duct: UL 181, Class 1 air duct with vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch WC positive and 1.0-inch WC negative.
2. Maximum Air Velocity: 5000 fpm.
3. Vapor Barrier Permeance: 0.05 perm
4. Temperature Range: Minus 10 to plus 160 deg F.
5. Insulation R-value: 6.0

D. Flexible Duct Connection Accessories:

1. Low pressure (Not up stream of terminal units):
   a. Clamps: Nylon strap in sizes 3 through 20", to suit duct size.
   b. Sheet metal screws: No
   c. Liquid adhesive: No

d. Tape: Yes

2. Medium pressure (Up stream of terminal units):
   a. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with worm-gear action in sizes 3 through 20 inches, to suit duct size.
   b. Sheet metal screws: No
   c. Liquid adhesive: Yes
   d. Tape: Yes

2.9 DUCT SECURITY BARS

A. Manufacturers:

1. Keys
2. Price Industries.
3. United Sheet Metal
4. Field or Shop-Fabricated

B. Description: Factory, shop or field-fabricated and field-installed duct security bars rated for "Maximum Security."

C. Configuration:

1. Frame: 2¼" by 3/8" inches minimum steel bar.
2. Sleeve: 3/16-inch, continuously welded steel frames with 2¼"x2¼"x3/8" angle frame factory welded to one end and furnished loose for field welding on other end. To be welded or bolted in place, one side only. Duct connections as indicated.
3. Horizontal Bars: 2¼" by 3/8" minimum tool resistant steel conforming to ASTM A627-95.
4. Horizontal Bar spacing: 12" OC maximum.
5. Vertical Bars: 7/8" diameter minimum, ribbed on opposite sides, tool resistant steel conforming to ASTM A627-95.
6. Vertical Bar Spacing: 5" OC maximum.
7. Where duct security bars shall be installed within the same penetration/opening as a life safety damper, provide the security bars in the life safety damper sleeve. Installation of security bars with life safety damper shall maintain the UL listing of the damper. Life safety dampers include fire dampers, smoke dampers, and fire-smoke dampers.
8. Where duct security bars shall be installed in roof penetrations or openings, security bar assembly shall be coordinated and integrated with the roof curb and shall comply with this section.

2.10 ACCESSORY HARDWARE

A. Temporary Test Holes: Drilled in duct as required.

B. Permanent Test Holes: Cast iron, or cast aluminum, to suit adjacent material, including cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit wall + insulation thickness.

C. Adhesives: High strength, quick setting, waterproof, and resistant to grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Radius Forming Braces:

1. Connect flexible ducts to diffusers using a radius forming brace or rigid elbow. If using radius forming brace, deduct four duct diameters from the indicated maximum flexible duct length.

D. Volume Dampers:

1. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Locate at least two duct diameters from fittings and as far as possible from air outlets.
2. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
3. Set dampers to fully open position before testing, adjusting, and balancing.
   a. Install steel volume dampers in steel ducts.
   b. Install aluminum volume dampers in aluminum and stainless steel ducts.

E. Install motorized control dampers where indicated.

F. Install backdraft dampers at inlet of exhaust fans, exhaust ducts as close as possible to louver inlets, and where indicated.

G. Install fire dampers where indicated according to UL listing and manufacturer's written instructions.

H. Connect ducts to duct silencers with flexible duct connectors.

I. Turning Vanes:

1. Install turning vanes in all duct elbows larger than 12" in height or width.
2. Exceptions:
   a. Where prohibited by the applicable code, laws, ordinances or local requirements.
   b. Where specifically eliminated by Contract.

J. Provide remote damper operator where manual volume dampers are indicated above inaccessible ceilings.

K. Duct-Mounted Access Doors:

1. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
   a. On both sides of duct coils.
   b. Upstream or downstream of duct filters.
   c. At outdoor air intakes and mixed air plenums.
   d. Downstream of control dampers and backdraft dampers.
   e. Adjacent to fire or smoke dampers to allow reset and reinstallation of fusible links.

f. Upstream or downstream of duct silencers.
g. At control devices requiring inspection.
h. Elsewhere as indicated.

2. Install access doors with swing against duct static pressure except at fire, smoke, and combination fire and smoke dampers.
3. Access Door Size: Largest of the following permitted by duct dimensions:

a. One-Hand or Inspection Access: 8 by 5 inches.
b. Two-Hand Access: 12 by 6 inches.
c. Head and Hand Access: 18 by 10 inches.
d. Head and Shoulders Access: 21 by 14 inches.
e. Body Access: 25 by 14 inches.
f. Body plus Ladder Access: 25 by 17 inches.

4. Label access doors to indicate purpose in accordance with Section 230553 "Identification for HVAC Piping and Equipment."

L. Flexible Connectors

1. Install flexible connectors to connect ducts to equipment- except smoke control/management equipment.
2. Where required, install thrust limiters at all flexible connectors consisting of a 1/16-inch diameter vinyl coated steel cable at 24" maximum on center, attached to flange bolts on each side of flexible connector. Cable length shall be such that, when in tension, 1/2" of movement in the flexible connection is preserved. If flanges are not used, provide steel, stainless steel, or aluminum angles for attaching cables. Match angle material to duct material. Cables shall attach to screw or fastener holding angle and shall be routed through a 3/16" diameter hole in the angle offset approximately 1" from duct.

M. Connect flexible ducts to metal ducts as follows:

1. Low pressure (Not upstream of terminal units):
   a. Clamps: Install in accordance with manufacturer's recommendations.
   b. Tape: Install in accordance with manufacturer's recommendations.
   c. Cable Ties (18 lb. strength): Install in accordance with manufacturer's recommendations.

N. Flexible Ducts

1. Install flexible duct fully extended with no more than 1/2" compression or sag. Do not provide excess length for future relocation of components. Bends shall equal or exceed one duct diameter bend radius based on the inside duct diameter (no sharp corners or kinks). Tape and mastic for sealing flexible duct to metal fittings shall be listed and labeled to UL Standard 181B. Hanging straps, if used, shall include a saddle to avoid crimping the duct. For ducts 12 inches and smaller in diameter, provide a 3" wide saddle. For ducts larger than 12 inches in diameter, provide a 5" wide saddle.
2. Connect supply ceiling diffusers and return grilles to low pressure supply and/or return ductwork where indicated on drawings with [**five**] feet maximum length of flexible duct. Provide a radius forming elbow to support flexible duct at diffuser connection unless noted otherwise. Flexible duct not permitted on exhaust systems.

O. Install duct security bars where indicated. Provide 12-inch x 12-inch hinged access panel with cam lock in duct on each side of sleeve.

P. Install rooftop duct supports for all roof-mounted ductwork.

3.2 TESTING AND BALANCING

A. Install permanent test holes at fan inlets and outlets within 6 inches of fan, where indicated, and where necessary for testing and balancing. Test holes not required at outlet of roof-mounted fans.

B. Install temporary test hole plugs in temporary test holes. Repair insulation at temporary test holes.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement without interference.
2. Inspect access doors. Verify that door can be opened and closed. Verify fire damper, and combination fire and smoke damper fusible links can be reset and changed. Verify fire damper, and combination fire and smoke damper doors open in the direction of air pressure (out on supply ducts and in on return and exhaust ducts).
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement, verify non-interference, and verify that the proper heat-response device is installed.
4. Inspect elbows for turning vanes. Verify they are installed where required.
5. Inspect turning vanes using access doors for proper and secure installation.
6. Operate remote damper operators prior to ceiling installation to verify full range of movement of operator and damper. Verify no interference with damper movement.

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Operating Limits: Classify according to AMCA 99.

B. Curb shims:
1. Permitted: On one edge only and then only for edge lengths equal to or less than 48".
2. Continuous: From one corner to the other.
3. Structural Support: Continuous along entire length of shim.
4. Material: Steel.
5. Minimum Thickness: 1/16".
6. Maximum Overall Thickness: 1".

1.3 SUBMITTALS

A. Product Data: Provide manufacturer's technical data for each ventilator including rated capacities, dimensions, required clearances, operating characteristics, mounting requirements, and furnished specialties and accessories. Provide power and control wiring diagrams. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs with required slope and dimensions. Indicate shimming if required.
7. Security fasteners.
8. Fan speed controllers.

B. Product Data: Include manufacturer's technical data for each ventilator, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, accessories, and mounting requirements.

C. Shop Drawings:

1. Detail equipment assemblies, include:

a. Internal components
b. Dimensions

c. Weights
d. Loads
e. Supports
f. Required clearances.

2. Provide method of field assembly.
3. Indicate:

a. Components
b. Location
c. size of each field connection

4. Provide Wiring Diagrams for:

a. Power
b. Signal
c. Control

5. For ventilator support comply with performance requirements and design criteria, including analysis data signed and sealed by a qualified professional engineer responsible for selection.

a. Calculations: Calculate requirements for selecting vibration isolation, seismic restraint where required**,** and for vibration isolation.
b. Detail mounting, securing, dimensions, slope, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system. Indicate shimming if required.
c. Restraint: Detail fabrication and attachment of restraints. Indicate anchorage details, quantity, diameter, and connections.

D. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are indicated and coordinated using input from installers:

1. Plan areas containing a ventilator indicated at ¼" = 1'- 0" or greater on construction drawings.
2. Areas within 20 feet of section marks indicated on M2 series drawings where such section marks penetrate a ventilator.
3. Structural members to which ventilators will be attached.
4. Related roof openings.
5. Related roof curbs, slope, dimensions, and flashing. Include shimming if required.

E. Operation and Maintenance Data: For ventilators to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.4 TOOLS

A. Four (4) complete tools (all hardware) required to remove and reinstall security fasteners.

B. Specifications, including size, of tool required to remove and reinstall security fasteners.

C. The name and address of three local tool suppliers where tools may be obtained.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for grease (kitchen) hood exhaust shall also comply with UL 762.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATOR(S) (DOWNBLAST)

A. Manufacturers:

1. Acme Engineering & Manufacturing Corporation.
2. Twin City Fan & Blower.
3. Greenheck Fan Corporation.
4. Loren Cook Company.

B. Housing: Removable, spun-aluminum dome top and outlet baffle, or extruded-aluminum, rectangular top to direct discharge air downward.

C. Base (Curb Cap): Square, one-piece, aluminum with venturi inlet cone.

D. Hinged Sub-Base: Galvanized steel hinged arrangement permitting service and maintenance.

E. Fan Wheels: Statically and dynamically balanced aluminum hub and wheel with backward-inclined blades matched to inlet cone.

F. Belt Drives (where indicated in Fan Schedule): Comply with the following:

1. Provide drives sized for a minimum of 150% of driven horsepower.
2. Provide resilient mounting to housing.
3. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

4. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
5. Pulleys: Cast-iron, adjustable-pitch motor pulley.
6. Fan and motor isolated from exhaust airstream
7. Belt(s): Provide grip notch belt(s). Provide belt tensioner.
8. Motors and drives:

    a. Mount on vibration isolators.
    b. Draw air for motor cooling into the motor compartment from an area free of discharge contaminants.
    c. Make readily accessible for maintenance.

G. Direct Drives (where indicated in Fan Schedule): Comply with the following:

1. Motor enclosure: Open type.
2. Motor shall be DC electronic commutation type motor (ECM).
3. Motor shall be permanently lubricated, heavy duty ball bearing type to match with the fan load and prewired to the specific voltage and phase.
4. Internal motor circuitry to convert AC power supplied to fan to DC power to operate motor.
5. Motor shall be speed controllable down to 20% of full speed. Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal.

H. Overload (Running) Protection:
1. Provide motor overload protection as a requirement of this section.
2. Provide motor overload protection as recommended by the manufacturer
3. Comply with the Section 230513 "Motors for HVAC Equipment."

I. Wind-band: Join to curb-cap with leak-proof continuously welded seam.

J. Accessories:

1. Provide disconnect switch.
2. Provide removable, 1/2-inch mesh, aluminum or brass wire bird screen.
3. Provide parallel-blade dampers mounted in fan base or duct with normally closed electric actuator wired to close when fan stops. Actuator shall not be required to fail closed.
4. Motorized Backdraft Damper(s): Provide damper(s) with electric actuator(s) wired to close when fan stops and open with fan is on. Actuator voltage shall match fan motor voltage. Where matching actuator and fan voltage is not possible, fan manufacturer shall provide transformer to produce compatible voltage to actuator. Wiring of fan and backdraft damper actuator(s) shall be by Division 26.
5. Provide roof curb. Refer to Roof Curb Paragraph below.
6. Security Bars: Comply with Division 23 Section, 233300 "Air Duct Accessories"

2.2 CEILING-MOUNTED VENTILATORS

A. Manufacturers:

1. Acme Engineering & Manufacturing Corporation.
2. Greenheck Fan Corporation.
3. Loren Cook Company.

4. Twin City Fan & Blower.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Plastic, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Provide accessories:

1. Backdraft damper: Gravity backdraft damper integral to fan.
2. Filter: Washable aluminum to fit between fan and grille.
3. Isolation: Rubber-in-shear vibration isolators.
4. When fan motor is not electronically commutated (EC), provide integrated speed controller for final balancing.
5. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.

2.3 PROPELLER FANS

A. Manufacturers:

1. Acme Engineering & Manufacturing Corporation.
2. Greenheck Fan Corporation.
3. Loren Cook Company.
4. Twin City Fan & Blower.

B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.

D. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

E. Provide accessories:

1. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
2. Wall Sleeve: Galvanized steel to match fan and accessory size.
3. When fan motor is not electronically commutated (EC), provide integrated speed controller for final balancing.
4. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

5. Motorized Backdraft Damper(s): Provide damper(s) with electric actuator(s) wired to close when fan stops and open with fan is on. Actuator voltage shall match fan motor voltage. Where matching actuator and fan voltage is not possible, fan manufacturer shall provide transformer to produce compatible voltage to actuator. Wiring of fan and backdraft damper actuator(s) shall be by Division 26.

2.4 UTILITY SET FANS

A. General: Provide direct drive in AMCA arrangement 4 or according to Drawings. Provide lifting lugs.

B. Fan Housing and Outlet:
1. Airtight construction with scroll panel formed and embedded into side panels.
2. All interior and exterior surface untreated steel shall be coated with a high-performance powder coating.
3. Arrangement 4 has fan wheel directly coupled to the motor shaft.
4. Housing and bearing support shall be constructed of bolted framework.

C. Fan Wheel:
1. The fan wheel shall be of the single width backward inclined centrifugal type.
2. Statically and dynamically balanced to balance grade G6.3 per ANSI S2.19.
3. The wheel and fan inlet shall be carefully matched and shall have precise running tolerances for maximum performance and operating efficiency.

D. Fan Motor: Motors shall be open type enclosure and electronic commutation type motor (ECM). Motors shall be permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal. Motor shall be a minimum of 85% efficient at all speeds.

2.5 MOTORS

A. Refer to section "Common Motor Requirements for HVAC Equipment."

B. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.

1. Motor Sizes: Size shall be as indicated. If not indicated, provide motor large enough to drive load and avoid operation in service factor range above 1.0.
2. Controls: Provide controllers, electrical devices, and wiring to comply with requirements specified in Division 26 Sections.

C. Enclosure Type: Totally enclosed, fan cooled.

2.6 FASTENERS

A. Security: Button head 1/4" diameter by 1-1/4" long (minimum size) sheet metal screws with torx head and center reject pin.

B. Refer to paragraph "SUBMITTALS"

2.7 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

2.8 ROOF CURB:

A. Minimum Height from Top of Roof Insulation for Non-Grease Fans: 12".

B. Slope: Match structure. Top of curb shall be level and each edge shall be flush with other edges on all sides.

C. Curb Material: Match material of power ventilator located on roof curb.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install HVAC Power Ventilators level and plumb.

B. Secure roof-mounted fans to roof curbs with security fasteners. Refer to Section "Roof Accessories" for other installation requirements for roof curbs.

C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

D. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 0.5 inches.

E. Install units with clearances for service and maintenance.

F. Label units.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that Shipping blocking and bracing are removed.
2. Verify that unit is secure and connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. For belt drive units disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align belts, adjust belt tension, and install belt guards.
5. Adjust damper linkages & operators for proper damper operation.
6. Verify lubrication for bearings and other moving parts.
7. Verify that manual and automatic volume control, fire, smoke, and fire/smoke dampers in connected ductwork systems are in a fully open position.
8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm.
9. Measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.3 TESTING, ADJUSTING, BALANCING, AND LUBRICATION

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section "Testing, Adjusting, and Balancing for HVAC".

C. Replace fan and motor pulleys to achieve design airflow.
1. Disable automatic temperature-control operators, energize motor and adjust fan to required rpm.
2. Measure and record RPM.
3. Measure and record motor voltage and amperage.

D. Re-lubricate bearings.

END OF SECTION 233423

SECTION 233600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

1. Seismic Hazard Level A: Force to weight ratio = 0.48.
2. Seismic Hazard Level B: Force to weight ratio = 0.30.
3. Seismic Hazard Level C: Force to weight ratio = 0.15.

1.3 ABBREVIATIONS

A. BAS Building Automation System.

B. CFM Cubic Feet per Minute.

C. ECM Electronically Commutated Motor.

D. PSIG Pounds per Square Inch Gauge.

E. PSC Permanent Split Capacitor

F. SCR Silicon Controlled Rectifier.

G. VA Volt Amps. (A measure of transformer power)

1.4 SUBMITTALS

A. Pre-submittal Meeting: A representative of the manufacturer producing equipment being provided under this section of the specifications shall attend a meeting for the purpose of coordinating with the contractor performing work under section "Building Automation System". The meeting shall be held at a location of the Contractor's choosing. The Contractor shall arrange the meeting. Submittals shall be essentially complete at the time of the meeting so detailed coordination items can be discussed.

B. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Air terminal units.
2. Liners and adhesives.
3. Sealants and gaskets.
4. Seismic restraint devices.

C. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Hangers and supports, including methods for duct and building attachment, bracing, and vibration isolation.

D. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

PART 2 - PRODUCTS

2.1 PARALLEL FAN POWERED AIR TERMINAL UNITS

A. Manufacturers:

1. Anemostat Products.
2. MetalAire, Inc.
3. Nailor Industries, Inc.
4. Price Industries.
5. Titus.
6. Trane.

B. Configuration: Volume-damper assembly and fan in parallel arrangement inside unit casing with control components inside a protective metal shroud.

C. Casing: Single wall.

1. Casing Lining: Adhesive attached, 1" thick fiberglass insulation complying with UL 181 erosion requirements, and having a maximum flame spread index of 25 and a maximum smoke developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
2. Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket and quarter-turn latches.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Motorized Volume Damper: Galvanized steel with flow sensing element, peripheral gasket, and bearings. Operating range shall be 90 degrees.

E. Velocity Sensors: Multipoint array with velocity sensors in inlet duct connection.

F. Motor: Refer to Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Type: ECM or PSC. Refer to Schedule on Drawing M0.2.
2. Design: Designed for speed control. Use with a SCR or other technology for fan speed adjustment. Provide means of speed control on the terminal unit by the terminal unit manufacturer.

G. Fan:

1. Type: Forward curved centrifugal.
2. Isolation: Rubber in shear.
3. Speed Control: Infinitely adjustable.

H. Filters: Where return is not ducted to unit, provide 1" thick, pleated filter, MERV 8, in filter rack at terminal unit inlet.

I. When indicated provide an Electric-Resistance Heating Coil: Nickel-chromium 80/20 heating wire, mounted in ceramic inserts in a galvanized steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless steel hardware.

1. Control Stage(s)/Step(s): As indicated.
2. Access door interlocked disconnect switch: Yes.
3. High temperature limit: Downstream air temperature sensor with local connection to override discharge air temperature set point. Set point shall not exceed maximum discharge temperature set point. Discharge air temperature set point may not be used. If not used limit discharge air temperature to 180° F.

4. Airflow switch for proof of airflow: Yes.
5. Fan interlock contacts: Yes.
6. Fuses in terminal box for overcurrent protection: Yes for coils more than 48 A.
7. Switches and relays: Yes
8. Contactor for each step of control: Yes

J. Factory mounted and wired components:

1. Electrical components and BAS unit controller mounted in control box with removable cover. Incorporate single point electrical connection to power source.
2. Control Transformer: 50 VA minimum factory mounted transformer for control voltage. Input voltage shall match the circuit provided. Coordinate output voltage with contractor performing work under Section "Building Automation System". Provide terminal strip in control box and field wiring of BAS unit controller to terminal strip. Wiring shall be as indicated.
3. Wiring Terminations: Fan, heat, and controls to terminal strip. Terminal lugs to match quantities, sizes, and materials of branch-circuit conductors and BAS requirements. Enclose terminal lugs in terminal box sized according to NFPA 70.
4. Disconnect Switch: Factory mounted fused.

K. Control Panel Enclosure: NEMA 250, Type 1, with access panel sealed from airflow and mounted on side of unit to enclose controller furnished under Section "Building Automation System".

L. Electronic Controls: Provide bidirectional damper, integral airflow measurement device, and transducer. Control devices shall be compatible with temperature controls specified in Section "Building Automation System" and shall comply with the following:

1. Install microprocessor based controller furnished under Section "Building Automation System"
2. Install damper actuator provided under this section.
3. Provide airflow transducer. Output shall be compatible with controller.

M. Control Sequence:

1. As indicated in Section "Sequences of Control."

2.2 SHUTOFF AIR TERMINAL UNITS

A. Manufacturers:

1. Anemostat Products.
2. MetalAire, Inc.
3. Nailor Industries, Inc.
4. Price Industries.
5. Titus.
6. Trane.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

Casing: Single wall galvanized sheet steel.

1. Sheet Metal Thickness: Manufacturer's standard.
2. Casing Lining: Adhesive attached 1", fiberglass liner having a maximum flame spread index of 25 and a maximum smoke developed index of 50. Insulation shall comply with UL 181 erosion requirements.
3. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment. Provide flexible connector.
4. Air Outlet: S-slip and drive connections. Provide flexible connector.
5. Access: Removable panels with airtight gaskets for access to parts requiring service, adjustment, or maintenance.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Damper Position: Normally open.

D. When indicated, provide an Electric-Resistance Heating Coil: Nickel-chromium 80/20 heating wire, mounted in ceramic inserts in a galvanized steel housing; with primary automatic, and secondary manual, reset thermal cutouts. Terminate elements in stainless-steel, machine-staked terminals secured with stainless steel hardware.

1. Control Stage(s)/Step(s): As indicated.
2. Access door interlocked disconnect switch: Yes.
3. High temperature limit: Downstream air temperature sensor with local connection to override discharge air temperature set point. Set point shall not exceed maximum discharge temperature set point. Discharge air temperature set point may not be used. If not used limit discharge air temperature to 180° F.
4. Airflow switch for proof of airflow: Yes.
5. Fan interlock contacts: Yes.
6. Fuses in terminal box for overcurrent protection: Yes for coils more than 48 A.
7. Switches and relays: Yes
8. Contactor for each step of control: Yes

E. Factory mounted and wired components:

1. Electrical components mounted in control box with removable cover. Incorporate single point electrical connection to power source.
2. Control Transformer: 50 VA minimum factory mounted transformer for control voltage. Input voltage shall match the circuit provided. Coordinate output voltage with contractor performing work under Section "Building Automation System". Provide terminal strip in

control box and field wiring of BAS unit controller to terminal strip. Wiring shall be as indicated.

3. Wiring Terminations: Fan and controls to terminal strip. Terminal lugs to match quantities, sizes, and materials of branch-circuit conductors and BAS requirements. Enclose terminal lugs in terminal box sized according to NFPA 70.

4. Disconnect Switch: Factory mounted fused.

F. Control Sequence:

1. As indicated in Section "Sequences of Control."

2.3 HANGERS AND SUPPORTS

A. Hanger Rods: Cadmium-plated steel rods, neoprene 1/8" thick washers and nuts.

1. Vibration isolation washers should be used on both sides of threaded rod attachment to box to prevent vibration transmission to structure.

B. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

C. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

2.4 SEISMIC RESTRAINT DEVICES

A. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

B. Channel Support System: Shop or field fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

C. Restraint Cables: ASTM A 492, stainless steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; with an automatic locking and clamping device or double cable clips.

D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections. Or reinforcing steel angle clamped to hanger rod.

E. Mechanical Anchor Bolts: Drilled in and stud wedge or female wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.5 SOURCE QUALITY CONTROL

A. Label each air terminal unit with tag, nominal airflow, maximum and minimum factory-set airflows, coil type if coil is included, and ARI certification seal.

B. For hydronic coils include hose kit and control valve shrink wrapped and labeled with terminal unit tag.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder actuated concrete fasteners for standard-weight aggregate concretes and for slabs equal to or more than 4" thick.
4. Do not use powder actuated concrete fasteners for lightweight aggregate concretes and for slabs less than 4" thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install hangers and braces designed to support the air terminal units and to restrain against seismic forces required by applicable codes. Comply with ASCE/SEI 7.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on air terminal units that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by [an evaluation service member of the ICC Evaluation Service] [the Office of Statewide Health Planning and Development for the State of California] [an agency acceptable to authorities having jurisdiction].

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items before drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Install heavy-duty sleeve anchors with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.4 CONNECTIONS

A. Connect ducts to air terminal units according to division 23 duct specification sections for metal and flexible ducts.

B. Make connections to air terminal units with flexible connectors complying with requirements in Division 23 Section "Air Duct Accessories."

3.5 IDENTIFICATION

A. Label each air terminal unit with tag, nominal airflow, and maximum and minimum factory set airflows. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for equipment labels and warning signs/labels.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Air terminal unit will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 233600

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, mounting details, and performance data including throw, drop, static pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Installation Drawings: Drawn to scale (Minimum 1½" = 1'-0"), on which the following items are indicated:

1. Trim & borders.
2. Ceiling suspension assembly members.
3. Method of attaching hangers to building structure.

PART 2 - PRODUCTS

2.1 DIFFUSERS, GRILLES, AND REGISTERS

A. Manufacturers:

1. Anemostat.
2. Krueger.
3. MetalAire, Inc. / Greenheck.
4. Nailor Industries.
5. Price Industries.
6. Titus.
7. Tuttle & Bailey.

B. General:

1. The basis of design for each grille register and diffuser is indicated on the drawings. The contractor shall provide equivalent products by one of the listed manufacturers.
2. Where aluminum construction is indicated blades and frames shall be extruded.

3. All trim pieces shall be mechanically fastened. Friction fit trim rings/frames shall not be provided or shall be mechanically fastened in the field. Fasteners shall not be visible.
4. Units located on walls in heavy use areas including but not limited to basketball courts, gymnasiums, and shop areas shall be heavy duty steel.
5. Finish:
    a. Powder-coated or baked enamel, white, unless noted otherwise.
    b. Finish for Exposed Ductwork: Where ductwork is exposed, inlets and outlets mounted in exposed ductwork shall be factory primed for field painting or provided with anodized clear finish where indicated.
6. Mounting: As indicated in schedule or match condition indicated.

C. Ceiling Diffusers

1. Ceiling diffuser backpans shall be externally insulated. Provide one of the following:
    a. Factory-installed with foil/scrim vapor barrier insulation with a minimum R-value of 6.
    b. Field-installed external insulation on backpans not factory-insulated. Refer to Section 230700 HVAC Insulation.

2. For diffusers connected to flexible duct, provide one of the following:
    a. Diffuser manufacturer's optional extended depth, beaded inlet neck.
    b. Field-provided 4" long duct collar with diameter matching diffuser inlet. Attach to diffuser inlet with a minimum of four sheet metal screws evenly distributed around collar.

2.2 SECURITY REGISTERS AND GRILLES

A. Manufacturers:

1. A & J Manufacturing.
2. Anemostat.
3. Krueger.
4. Kees
5. MetalAire, Inc.
6. Price Industries.
7. Titus.
8. Safety Concepts; S-vent.

B. Material: Steel.

C. Finish: Baked enamel, white.

D. Maximum Security Grilles Only - Face Arrangements:

1. 3/16-inch-thick perforated faceplate with 3/16-inch diameter holes spaced 9/32 inch on center, staggered at 60 degrees.

2. Provide manual volume damper adjustable through face of grille.

E. Wall Sleeve: 3/16" steel mechanically fastened to border.

F. Damper Type: Adjustable opposed-blade assembly where indicated on schedule.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Install diffusers, registers, and grilles flush with ceiling unless otherwise indicated in contract documents.

C. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Install in locations indicated, as much as practical. For units installed in lay-in ceiling panels, center units in both directions in panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

D. Linear Slot Diffuser Installation: For typical diffuser, adjust each slot diffuser so half the slots throw horizontally along the ceiling in each direction unless indicated otherwise on drawings. For linear slot diffusers above windows at building perimeter, one half of the total slots at each diffuser shall be adjusted to throw air vertically downward to wash window and the other half of the slots shall be adjusted to throw air horizontally across ceiling unless indicated otherwise.

E. Diffusers, registers and grilles shall be supported independently of the ceiling system and shall not be supported from conduit, piping or unrelated ductwork.

F. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 233723 - HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Hooded ventilators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For gravity ventilators.

   1. Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.
   2. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

C. Samples: For each exposed product and for each color and texture specified.

D. Delegated-Design Submittal: For shop-fabricated ventilators indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

   1. Detail fabrication and assembly of shop-fabricated ventilators.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof-framing plans and other details, drawn to scale, and coordinated with each other, based on input from installers of the items involved:

B. Seismic Qualification Data: Certificates for ventilators, accessories, and components, from manufacturer.

C. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

   1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
   2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.5 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ventilators.

B. Structural Performance: Ventilators shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of ventilator components, noise or metal fatigue caused by ventilator 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.

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

D. ASHRAE 62.1 Compliance: Section 5, "Systems and Equipment" and Section 7, "Construction and System Start-up."

E. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

2.2 FABRICATION

A. Factory or shop fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

2.3 HOODED VENTILATORS

A. Description: Hooded round penthouse for exhaust air.

1. Greenheck.
2. Ruskin.
3. Cook.

B. Construction:

1. Material: Galvanized steel, of thickness required to comply with structural performance requirements, but not less than 0.064-inch-thick base and 0.040-inch-thick hood; suitably reinforced.
2. Insulation: Mineral-fiber insulation and vapor barrier.
3. Bird Screening: Stainless-steel, 1/2-inch-square mesh wire

C. Galvanized-Steel Finish:
1. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and an overall minimum dry film thickness of 2 mils (0.05 mm).

a. Color and Gloss: As selected by Architect from manufacturer's full range of custom colors.

D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch-thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with Built-in raised cant and mounting flange.
2. Overall Height: Minimum 10" taller than roof surface, coordinate roof thickness with roofing contractor.

2.4 GOOSENECKS

A. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 6-5; with a minimum of 0.052-inch- (1.3-mm-) thick, galvanized-steel sheet.

B. Construction:
1. Bird Screening: Stainless-steel, 1/2-inch-square mesh wire

C. Galvanized-Steel Finish:
1. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and an overall minimum dry film thickness of 2 mils (0.05 mm).

a. Color and Gloss: As selected by Architect from manufacturer's full range of custom colors.

D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch-thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with Built-in raised cant and mounting flange.
2. Overall Height: Minimum 10" taller than roof surface, coordinate roof thickness with roofing contractor.

2.5 MATERIALS

A. Galvanized-Steel Sheet: ASTM A653/A653M, G90 zinc coating, mill phosphatized.

B. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.

C. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors made from stainless-steel components, with capability to sustain without failure a load equal to 4 times the loads imposed for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.

B. Secure gravity ventilators to roof curbs with zinc-plated hardware, that comply with the wind requirements. Use concealed anchorages where possible. Refer to Section 077200 "Roof Accessories."

C. Install gravity ventilators with clearances for service and maintenance.

D. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Section 079200 "Joint Sealants" for sealants applied during installation.

F. Label gravity ventilators according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes, so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

I. Refer to Section 077200 "Roof Accessories" for flashing and counterflashing of roof curbs.

END OF SECTION 233723

SECTION 234100 - PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

B. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. Construction Filter: A filter maintained during construction to protect ductwork from construction dust, dirt, and debris. Construction filters shall be removed temporarily during balancing and permanently after the building is occupied.

D. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

E. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

F. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

G. HEPA: High-efficiency particulate air.

H. VUSBC: Virginia uniform statewide building code.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated include dimensions, required operating clearances, required access clearances, and weights.

B. Operating Characteristics: For each type of product indicated provide rated flow capacity, initial and final pressure drop at rated flow capacity.

C. Efficiency: For each type of product indicated provide efficiency and test method.

D. Fire Classification: For each type of product indicated provide the fire classification.

E. Specialties and Accessories: For each type of product indicated provide furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of filter and rack to include in emergency, operation, and maintenance manuals.

B. Replace all permanent filters with new filters of types specified.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Comply with applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality"; Section 5 - "Systems and Equipment"; and Section 7 - "Construction and Startup."
2. Comply with ASHRAE 52.1 for arrestance and ASHRAE 52.2 for MERV for methods of testing and rating air-filter units.

C. Comply with NFPA 90A and NFPA 90B.

1.6 COORDINATION

A. Coordinate sizes and locations:
1. Within air handling units.
2. On open return ducts during construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. Air Filters, and Filter-Holding Systems:

a. 3M.
b. Airguard.
c. American Air Filter Company, Inc. Flanders.
d. Camfil USA.
e. Columbus Industries, Inc.
f. Koch Filter Corp.

2. Filter Gages:

a. Airguard Industries, Inc.
b. Dwyer Instruments Inc.

2.2 GENERAL FILTERS

A. For return filter grilles, fan powered VAV boxes, general filtration, and construction filters provide the following:
   1. Media: Cotton and synthetic pleated with an average efficiency of 25-30% and an average arrestance of 90-92% in accordance with ASHRAE test standard 52.1-1992.
   2. Thickness: Unless otherwise indicated thickness shall be 2".
   3. Media Support Grid: Welded wire on 1" centers with 96% free area bonded to the media.
   4. Filter Frame: High wet strength cardboard with diagonal support members bonded to the media on the entering side and exiting side of each pleat.
   5. Holding Frame: Galvanized steel with metal grid on outlet side, polyurethane gaskets, and spring fasteners.
   6. Farr 30/30 or equal.

2.3 PRE-FILTERS

A. Where pre-filters are indicated and for construction filters provide the following:
   1. Media: Cotton and synthetic pleated with an average efficiency of 25-30% and an average arrestance of 90-92% in accordance with ASHRAE test standard 52.1-1992.
   2. Thickness: Unless otherwise indicated thickness shall be 4".
   3. Media Support Grid: Welded wire on 1" centers with 96% free area bonded to the media.
   4. Filter Frame: High wet strength cardboard with diagonal support members bonded to the media on the entering side and exiting side of each pleat.
   5. Holding Frame: Galvanized steel with metal grid on outlet side, polyurethane gaskets, and spring fasteners.
   6. Farr 30/30 or equal.

2.4 FINAL FILTERS (CARTRIDGE TYPE)

A. Where final filters are indicated on the drawings provide the following:
   1. Media: High density microfine glass fibers, laminated to a reinforcing backing to form a lofted filter blanket.
   2. Minimum Efficiency Reporting Value: MERV 13 in accordance with ASHRAE 52.2-2025.
   3. Thickness: Unless otherwise indicated thickness shall be 12".
   4. Media Support Grid: Welded wire on 1" centers with 96% free area bonded to the media.
   5. Contour Stabilizers: Aluminized zinc finished steel strips permanently installed on the entering and leaving side of the filter. Filter shall withstand 10" of static pressure drop without noticeable distortion.
   6. Filter Frame: Aluminized zinc finished steel with filter pack mechanically and chemically bonded to eliminate air bypass. Provide aluminized zinc finished steel diagonal supports
   7. Holding Frame: 16 Gauge galvanized steel with polyurethane gaskets, and positive sealing fasteners.

8. Farr Riga-Flo 100 or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Position each filter with clearance for normal service and maintenance.

B. Install filters to prevent passage of unfiltered air.

C. Do not operate fan system until filters are in place. During construction, all ductwork must be protected from dirt and debris. Remove filters used during construction and testing. Replace all filters in units with new filters of types specified.

D. Unit operation during construction:
   1. Install minimum MERV 8 construction filters to protect all return ductwork from dirt and debris. Supply fan shall operate at all times.

E. Unit not operating during construction:
   1. Install plastic sheet material over all supply and return openings to protect all ductwork from dirt and debris.
   2. Fans shall be off.

F. Construction filter installation: Adhere all edges of filter with metal foil peel-n-stick tape having an acrylic adhesive.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Check for leakage of unfiltered air while system is operating.

B. Air filter and installation will be considered defective if they do not pass.

C. Prepare a report for each filter.

3.3 TESTING AND BALANCING

A. Immediately prior to testing and balancing, install new filters of the same type that shall be permanently installed.

END OF SECTION 234100

SECTION 237413 - PACKAGED AIR HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 ABBREVIATIONS

A. ABMA American Bearing Manufacturers Association. (www.abma-dc.org)

B. AI Analog Input (analog value input to the BAS from the unit controller)

C. AO Analog Output (analog value output from BAS to the unit controller)

D. ANSI American National Standards Institute. (www.ansi.org)

E. BAS Building Automation System.

F. BI Binary Input (binary value input to the BAS from the unit controller)

G. BO Binary Output (binary value output from BAS to the unit controller)

H. CFM Cubic Feet per Minute.

I. DDC Direct-digital controls.

J. ECM Electrically commutated motor.

K. FPM Feet Per Minute.

L. RTU Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central station air handling unit. This abbreviation is used regardless of whether the unit is mounted on the roof or on an equipment pad on the ground.

M. RTU's Rooftop units. As used in this Section, this abbreviation means packaged, outdoor, central station air handling units. This abbreviation is used regardless of whether the units are mounted on the roof or on equipment pads on the ground.

N. SS Stamped Steel

O. VAV Variable-air volume

P. W Wire

Q. WG Water Gauge

R. VFD Variable Frequency Drive

1.3 DEFINITIONS

A. Archival Quality: Will last a minimum of 20 years.

B. Head end: Main temperature control computer system storing data accessible to the internet for WEB accessible systems and storing data accessible to the building system backbone for non-WEB accessible systems.

C. HP Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations.

D. Modulating: Able to electrically vary and stop in any position.

E. Outdoor air: Air outside the building or taken from outdoors and not previously circulated through the building.

F. Outdoor air measurement: Reporting of the volume of outdoor air taken into the building by RTU and reported to the building operator in CFM.

G. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations.

H. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

I. Record: Maintain in writing on original paper and maintain a copy in electronic format, file type Portable Document Format (*.PDF) is acceptable. Make paper copy available for inspection upon request by Owner, Owner's representative, Architect, or Architect's representative. Email electronic copy to requested email address when request is made by the Owner, Owner's representative, Architect, or Architect's representative. Document shall be "openable" by Owner and Architect's computer.

J. Supply-Air Fan: Fan providing supply air to conditioned space.

K. Supply air: Air entering a space from air-conditioning, heating, or ventilating equipment.

L. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

M. Two-position: Able to electrically move and stop in only two positions. Usually open or closed.

1.4 PERFORMANCE REQUIREMENTS

A. Support: RTU supports shall comply with required wind and seismic performance requirements, including analysis by a qualified professional engineer.

B. Wind-Restraint Performance shall comply with SEI/ASCE 7 for wind speed and building classification category. Provide minimum 10 lb/sq. ft. multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

C. Seismic Performance: RTUs shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. Unless otherwise indicated the term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified." The unit will not be required to operate after the event.

1.5 SUBMITTALS

A. Pre-submittal Meeting: A representative of the manufacturer producing equipment being provided under this section of the specifications shall attend a meeting for the purpose of coordinating with the contractor performing work under section "Building Automation System". The meeting shall be held at a location of the Contractor's choosing. The Contractor shall arrange the meeting. Submittals shall be essentially complete at the time of the meeting so detailed coordination items can be discussed.

B. Product Data: Provide manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, accessories, and mounting requirements.

C. Exterior Color: Manufacturer's standard color shall be acceptable.

D. Shop Drawings:

1. Detail equipment assemblies, include:
   a. Internal components
   b. Dimensions
   c. Weights
   d. Loads
   e. Supports
   f. Required clearances.
2. Provide method of field assembly.
3. Indicate:
   a. Components
   b. Location
   c. Size of each field connection
4. Provide Wiring Diagrams for:
   a. Power
   b. Control

5. For RTU Support comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for support selection.
   a. Calculations: Calculate requirements for selecting vibration isolation, seismic restraint where required**,** and for vibration isolation.
   b. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system, curb slope, and curb dimensions.
   c. Restraint: Detail fabrication and attachment of restraints. Indicate anchorage details, quantity, diameter, and connections.

E. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are indicated and coordinated using input from installers:

1. Plan areas containing an RTU indicated at ¼" = 1'- 0" or greater on construction drawings.
2. Areas within 20 feet of section marks indicated on M2 series drawings where such section marks penetrate an RTU.
3. Structural members to which RTUs will be attached.
4. Related roof openings.
5. Related roof curbs, slope, dimensions and flashing.

F. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," Provide the following:

1. After successful completion of testing & balancing, or commissioning provide the following:
   a. Completed Inspection & Testing form.
   b. Record copy of site-specific software on DVD.
   c. Maintenance, Inspection and Testing Records including, may not be limited to, the following:
      1) How to test installed components.
      2) Frequency of testing of installed components.
      3) Frequency of inspection of installed components.
      4) Manufacturer's user training manuals.
2. Manufacturer's required maintenance related to system warranty requirements.
3. Software and Firmware Operational Documentation:
   a. Software operating and upgrade manuals.
   b. Program Software Backup: On magnetic media or compact disk, complete with data files.
   c. Device address list.
   d. Printout of software application and graphic screens.

G. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1-2010, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. System safety. Comply with one of the following:

1. ASHRAE 15 for refrigeration system safety.
2. ASHRAE/IESNA 90.1-2010 applicable requirements in Section 6 - "Heating, Ventilating, and Air-Conditioning."
3. NFPA 90A and NFPA 90B.
4. UL 1995.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to provide labor and materials to remove and replace components of RTU's that fail in materials or workmanship within the following warranty period.

1. Compressors: 5 years from date of Substantial Completion.
2. Gas Furnace(s): 5 years from date of Substantial Completion.
3. VFD: 3 years from date of Substantial Completion.
4. Remainder of unit: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Trane (*Basis of Design)*.

B. Carrier Corporation.

C. Johnson Controls.

D. Daikin Applied.

2.2 GENERAL

A. For RTU-1: Provide a Packaged VAV air handling units with 5 stages of cooling (or variable speed compressor on lead circuit), variable speed supply and relief fan with VFD, double wall casing, with modulating SCR electric pre-heat, outdoor air and return air dampers, an outdoor air flow measuring station and factory installed controls as required by this specification. The relief fan shall include building pressurization control. The unit shall include 100% air-side economizer capabilities with differential enthalpy control. Supply downstream static pressure control. Outside airflow measuring to control outside air damper to airflow setpoint.

B. For RTU-2: Provide a Packaged CAV air handling unit with natural gas burner.

2.3 CASINGS

1. General:

   a. Fabrication Requirements: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.
   b. Exterior Material: Manufacturer's standard thickness galvanized steel and coated with factory-painted baked enamel finish, tested 750 hour in a salt spray test in compliance with ASTM B117, exterior color shall be manufacturer's standards, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
   c. Interior Material: Galvanized steel zinc coated with no finish or factory standard finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections. Construct supply and return opening with raised lip to ensure condensate will not spill into openings during overflow condition in primary condensate pan.

2. Fan Discharge Plenum Interior Material: Galvanized steel with no finish or factory standard finish.

3. Insulation and Adhesive:

   a. Comply with NFPA 90A or NFPA 90B.
   b. Materials: ASTM C 1071, Type I.
   c. Thickness: 2" (R-value of 13.0)
   d. Materials in contact with air stream shall have air-stream surface coated with an erosion- and temperature-resistant coating or they shall be faced with a plain or coated fibrous mat or fabric.
   e. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Condensate Drain Pans:

1. Formed sections of stainless-steel sheet, double sloped, a minimum of 2 inches deep, and complying with ASHRAE 62.1-2010.
2. Construction: Provide foam insulation on back. Double wall, foam insulated, moisture tight drain pans are acceptable.

3. Drain Connection(s): Threaded nipple with pan sloped in two directions to drain.
4. Length downstream of cooling coil: Provide pan at least ½ the height of air tunnel to ensure all carryover is collected and drained.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010 and UL 181.

2.4 ECONOMIZER SECTION

A. Unit shall be provided with an outdoor air economizer section. The economizer section shall include outdoor, return, and exhaust air dampers. The economizer operation shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include moisture eliminator filters to drain water away from the entering air stream. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be opposed blade design. Damper blades shall be as specified hereafter. A bird screen shall be provided to prevent infiltration of rain and foreign materials. Control of the dampers shall be by factory installed actuators. Damper actuator shall be of the modulating, spring return type. A comparative enthalpy control shall be provided to sense and compare enthalpy in both the outdoor and return air streams to determine if outdoor air is suitable for "free" cooling. If outdoor air is suitable for "free" cooling, the outdoor air dampers shall modulate in response to the unit's temperature control system.

2.5 FANS

A. Supply Fan: Direct drive or belt driven plenum type with factory installed VFD or variable speed ECM motor. Provide with permanently lubricated, motor installed on an adjustable fan base resiliently mounted in the casing. Provide aluminum wheel and steel scroll.

B. Exhaust/Relief Fan: Direct drive or belt driven plenum type with factory installed VFD or variable speed ECM motor. Provide with permanently lubricated, motor installed on an adjustable fan base resiliently mounted in the casing. Provide aluminum wheel and steel scroll.

C. Fan Shaft Bearings:

1. Prelubricated and Sealed, Ball Bearings: Self-aligning, pillow-block type with a rated life of 120,000 hours according to ANSI/ABMA 9

Or

2. Grease-Lubricated, Tapered-Roller Bearings: Self-aligning, pillow-block type with double-locking collars and 2-piece, cast-iron housing with grease lines extended to outside unit and a rated life of 120,000 hours according to ANSI/ABMA 11.

D. Fan Sound-Power Levels:
1. Fans, except condenser fans, shall meet or create lower sound power levels than those indicated.

2. Fans, except condenser fans, shall comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.

E. Fan Performance Rating: Except condenser fans factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."

F. Condenser Fan(s): Propeller mounted on shaft of permanently lubricated motor.

G. Fan Motor(s): Refer to section "Common Motor Requirements for HVAC Equipment."

2.6 COILS

A. Indoor Air Refrigerant Coil:

1. Aluminum fins, seamless copper tube with minimum 0.020" wall thickness, and equalizing vertical distributor.
2. Distribution: Interlaced.
3. Circuits: Minimum of one per compressor.
4. Casing: Galvanized steel.
5. Split: As indicated. If not indicated none required.
6. Leak Tested: 450 psig

B. Outdoor Air Refrigerant Coil:

1. Aluminum fins, seamless copper tube with minimum 0.020" wall thickness, and equalizing vertical distributor.
2. Distribution: Interlaced.
3. Circuits: Manufacturer's standard.
4. Casing: Galvanized steel.
5. Split: As indicated. If not indicated Manufacturer's standard.
6. Leak Tested: 450 psig

C. Hot Gas Reheat Coil:

1. Aluminum fins, seamless copper tube with minimum 0.020" wall thickness, and equalizing vertical distributor.
2. Distribution: Manufacturer's standard.
3. Circuits: Manufacturer's standard.
4. Casing: Galvanized steel.
5. Split: As indicated. If not indicated Manufacturer's standard.

D. Electric Resistance Heating:

1. Elements: Open coil permitted in constant volume applications, otherwise provide finned tubular.

2. Open Coil Wire: Eighty (80) percent nickel and twenty (20) percent chromium, supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.
3. Finned Tubular Wire: Eighty (80) percent nickel and twenty (20) percent chromium centered in a stainless steel tube filled with granular magnesium oxide. Stainless steel fin helically wound onto tube. Elements furnished with mounting flanges making them individually removable.
4. Casing: Galvanized steel.
5. Overtemperature Protection: Disk-type, automatically reset, thermal-cutout, safety device; serviceable through terminal box.
6. Overcurrent Protection: Manual-reset thermal cutouts, factory wired in each heater stage. Heater shall have pilot duty or automatic reset line voltage limit controls. Any circuit carrying more than 48 amps shall have fuse protection in compliance with NEC.
7. Control Panel: Unit mounted with disconnecting means and overcurrent protection. Include the following controls:
   a. Mercury contactors.
   b. SCR Controller: Full modulating control of electric heat
   c. Time-delay relay.
   d. Airflow proving switch.

2.7 COIL SECTION

A. Fabricate coil section to allow removal and replacement of coil(s) for maintenance and to allow in-place access for service and maintenance of coil(s).

B. Coils shall not act as a structural component of the unit.

2.8 REFRIGERANT CIRCUIT COMPONENTS

A. Provide gauge ports with Schrader valves for measuring suction and hot gas pressure.

B. Provide for operation of the unit for heating down to 0° F.

C. Provide for operation of the unit for cooling down to 35° F.

D. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

1. Lead Circuit: Digital scroll or scroll with VFD for modulating capacity down to 15% or less.

E. Refrigeration Specialties:

1. Refrigerant: R-454B.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.

5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves and unions installed in compressor suction and discharge lines.
9. Low-ambient kit high-pressure sensor.

F. The following is required for applications with hot gas reheat:

1. Hot-gas reheat solenoid valve with a replaceable magnetic coil.

2.9 AIR FILTRATION SECTION

A. Required sections: Provide filter sections indicated. If not otherwise indicated provide MERV 8 (30% efficient) 2" thick disposable pre-filters with MERV 13 (85% efficient) 4" thick final-filters.

B. Position: Final-filter shall be downstream of pre-filter

C. Refer to Division 23, Section "Filters"

2.10 DAMPERS

A. General Requirements for Dampers: Leakage rate, per AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2% of air quantity at 2000 FPM face velocity through damper and 4" WG pressure differential.

B. Outdoor Air Damper(s): Modulating opposed blade galvanized steel motorized mechanically fastened to cadmium plated steel operating rods in reinforced cabinet, with bird screen and intake hood. Damper can provide outside air flow measuring.

C. Return Air Damper(s): Modulating opposed blade galvanized steel dampers mechanically fastened to cadmium plated steel operating rod in reinforced cabinet. Can be inversely interlock with Outdoor Air Damper if factory standard.

D. Relief/Exhaust Damper: Modulating opposed blade galvanized steel motorized mechanically fastened to cadmium plated steel operating rods in reinforced cabinet, with bird screen and hood

E. Damper Motors:

1. Modulating.
2. Adjustable minimum and maximum position.

2.11 AIR FLOW MEASURING STATIONS

A. Airflow measuring stations located in outside air intake for VAV unit.

1. Provide AFMS integral to outdoor air control damper with minimum performance as follows:

a. Velocity Range: 300 to 2000 fpm
b. Maximum Leakage: 6 cfm/sq ft at 4 in. wg and 3 cfm/sq ft at 1 in. wg
c. Temperature Range: -20 F to 180 F
d. Accuracy: 5% of reading

B. Fan Inlet Sensor Probe Assemblies:
1. Sensor housings shall be mounted on 304 stainless steel blocks.
2. Mounting rods shall be field adjustable to fit the fan inlet and constructed of nickel-plated steel.
3. Mounting feet shall be constructed of 304 stainless steel.
4. The operating airflow range shall be 0 to 10,000 FPM unless otherwise indicated.
5. Temperature Range: -20 F to 180 F
6. Accuracy: 5% of reading

C. Locate airflow measuring stations as follows:
1. Outdoor Air: In outdoor air hood or in unit prior to air mixing per manufacturer's requirements.

2.12 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

B. Provide electrical power phase monitoring to shut down unit if a phase is lost.

2.13 CONTROLS

A. Basic Unit Controls:

1. The manufacturer furnishing units and the contractor installing units under this section shall refer to, among others, Section "Building Automation System" and Section "Sequences of Control", and the Seven (7) series control drawings for additional information regarding control of the equipment.
2. Provide a complete integrated microprocessor BACnet controller to control all unit functions including temperature control, scheduling, monitoring, unit safety protection, including compressor minimum run and minimum off times, and diagnostics. This system shall consist of all required temperature sensors, pressure sensors, controller and keypad/display operator interface. All MCBs and sensors shall be factory mounted, wired and tested.
3. The stand-alone DDC controllers shall not be dependent on communications with any on-site or remote PC or master control panel for proper unit operation. The microprocessor shall maintain existing set points and operate stand-alone if the unit loses either direct connect or network communications. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.
4. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote

heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation.

5. All digital inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip
6. The DDC controller shall have a built-in time schedule. The schedule shall be programmable from the unit keypad interface. The schedule shall be maintained in nonvolatile memory to ensure that it is not lost during a power failure. There shall be one start/stop per day and a separate holiday schedule. The controller shall accept up to sixteen holidays each with up to a 5-day duration. Each unit shall also have the ability to accept a time schedule via BAS network communications.
7. The keypad interface shall allow convenient navigation and access to all control functions. The unit keypad/display character format shall be 4 lines x 20 characters. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with look-up tables will not be accepted.

8. Provide control voltage transformer:

    a. Primary Voltage: As required
    b. Secondary Voltage: As required
    c. Load: As required - 100 VA minimum

9. Unit Mounted Control Panel:

    a. Furnish and install under this Section.
    b. Interface control panel with BAS via BACnet. Hardwire all points that are critical to keep unit running and to open close outdoor air damper in case BAS network goes down.
    c. Provide volatile memory backup.
    d. Provide software and firmware operational documentation including but not limited to:
        1) Software operating and upgrade manuals.
        2) Backup of Volatile Memory: On archival quality DVD or CD compliant disk, complete with data files.
        3) Device address list.
        4) Printout of software application and graphic

B. Refrigeration system control

1. The manufacturer furnishing equipment under this section shall provide all controls for the compressors and refrigeration system including but not limited to staging and safeties under this section.

C. Sequence of Control –

1. RTU-1: Multizone VAV Control, VAV downstream static control of supply fan, comparative enthalpy air-side economizer with building pressure sensor control of relief fan. Supply air temperature reset and downstream static reset using manufacturer standard pre-engineer controls and sequences. The downstream static control sensor shall be provided by RTU manufacturer and installed by BAS manufacturer. Outside air flow measuring to maintain constant outside air flow as supply fan ramps up and down with

outside air and return air damper adjustment. Supply air reset up to 60°F but will be reset if return relative humidity rises above set point (55% RH).

2. Refer to section "Sequences of Operation"

2.14 ACCESSORIES

A. Guards:

1. Provide coil guards of galvanized stamped steel, painted to match casing. Guards shall be on sides of unit. Coils shall not be clearly visible from any direction.

2.15 ROOF CURBS

A. Provide under this section.

B. Height: 8" greater than the highest portion of adjacent roof insulation.

C. Slope: Match structure. Top of curb shall be level and each edge shall be flush with other edges on all sides.

D. Roof Deck: Remove roof deck as required for ductwork and piping installation and insulation. Where pipe chases are provided remove roof deck inside curb and inside pipe chase.

2.16 STAINLESS STEEL WIRE MESH:

A. Provide with roof curb.

B. Material: Type 316 stainless steel 0.061" (1.8mm) diameter wire with 0.94" (10.9mm) square openings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs or grade for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Mounted Unit:

1. Roof Curb
   a. Coordinate roof penetrations.
   b. Coordinate flashing with roof manufacturer.
   c. Install curb on roof structure, secure with anchor bolts and make top edges of curb level and all edges flush with each other.
   d. Secure equipment to upper curb rail (level) as recommended by equipment manufacturer.
   e. Install roof deck and roof insulation inside the curb under the equipment.
   f. Install roof curb below equipment pipe chase where pipe chase is required/provided.
   g. Eliminate roof deck and insulation below pipe chase where pipe chase is required/provided.
   h. Attach stainless steel wire mesh to deck over opening in pipe chase between roof and space below.

B. Coordination: Coordinate penetrations and flashing.

3.3 FIELD QUALITY CONTROL

A. Whether or not use of equipment is otherwise permitted, startup service, tests, and inspections must be complete prior to running unit. Failure to perform startup service, tests, and inspections prior to running equipment shall grant the owner's representative authority to have the units/equipment removed from the site at the Contractor's expense. This paragraph shall not be construed to grant the Contractor permission to use the unit(s)/equipment specified in this section of the specifications.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Record results.

C. Tests and Inspections:

1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
2. Charge refrigerant coils with refrigerant and connect gauges. Use light that will show refrigerant leak and visually check for leaks. Pressure shall hold with no visible loss for 120 minutes (2 hours). Fix leaks.
3. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Replace or repair faulty equipment.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. RTU's or components will be considered defective if unit or components do not pass tests and inspections.

E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Verify that unit is secure on mountings and supporting devices and connections to piping, ducts, and electrical systems are complete.
2. Verify that proper thermal overload protection is installed in motors, controllers, and switches.
3. Disconnect fan drive system. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operation. Reconnect fan drive system, align and adjust belts to proper tension.
4. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
5. Verify that dampers fully open and close.
6. Inspect dampers for proper stroke.
7. Inspect damper blades and seals for visible defects.
8. Inspect coil fins. Comb damaged coil fins for parallel orientation.
9. Verify that proper thermal overload protection is installed for electric coils.
10. Install new filters.
11. If not direct drive place new belts on coat hook attached with ¼" long stainless steel sheet metal screws inside unit adjacent to existing belts where no damage will occur. Including but not limited to fans, energy recovery wheels, and enthalpy wheels.
12. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.
13. Verify that smoke dampers in connected duct system fully close when unit is deactivated.
14. Inspect for visible damage to unit casing.
15. If included in unit inspect furnace combustion chamber for visible damage.
16. Inspect coils, and fans for visible damage.
17. Inspect internal casing for visible damage.
18. Verify that labels are clearly visible.
19. Verify that clearances have been provided for servicing.
20. Verify that controls are connected and operable.
21. Clean condenser coil and inspect for construction debris.
22. If included in unit, clean furnace flue and inspect for construction debris.
23. Remove packing from vibration isolators.
24. Inspect fan wheel for operation without vibration and binding.
25. Start unit according to manufacturer's written instructions.
    a. Start cooling system.
    b. Do not operate below recommended ambient temperature.
    c. Complete startup sheets and attach 1 paper, and one "universally readable" electronic copy on USB flash drive, with startup report. Maintain a copy in electronic format, file type Portable Document Format (*.TXT, *.DOC, *.RTF, & *.PDF) file formats are acceptable. The file format must be one of those listed or the Owner and Architect must own a computer and software capable of reading the electronic file.
26. Inspect and record performance of interlocks and protective devices.
27. Verify sequence of operation.
28. Operate unit for an initial period as recommended or required by manufacturer.

29. Calibrate sensors including thermostats.
30. Adjust and inspect high-temperature limits.
31. With unit operating start cooling system, measure, and record the following when the ambient temperature is a minimum of 85° F:
    a. Coil leaving air, dry and wet bulb temperatures.
    b. Coil entering air, dry and wet bulb temperatures.
    c. Return air, dry and wet bulb temperatures.
    d. Outdoor air, dry and wet bulb temperatures.
    e. Outdoor air (condenser) coil, discharge air, dry bulb temperature.
32. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
    a. Supply air volume.
    b. Return air volume.
    c. Relief/exhaust air volume.
    d. Record relief/exhaust airflow station reading in CFM from BAS head end.
    e. Outdoor air intake volume.
    f. Record outdoor air intake airflow station reading in CFM from BAS head end.
33. Simulate maximum cooling demand by utilizing 100% outdoor air and lowering discharge air temperature. Record the discharge air temperature and outdoor air volume used for the simulation. During simulation operation inspect, measure, and record the following:
    a. Compressor refrigerant suction and hot gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

3.5 CLEANING AND ADJUSTING

A. Occupancy Adjustments: Within 12 months of the date of Substantial Completion, provide up to two (2) on site visits, during normal or other than normal occupancy hours as requested by owner, to assist in adjusting system.

B. After completing testing, adjusting, and balancing clean RTU's internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, filters.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units/equipment.

END OF SECTION 237413

SECTION 238126 – DUCTLESS SPLIT-SYSTEM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Drawings and general provisions of the Contract Documents apply to this Section.

1.2 SUMMARY

A. This Section includes ductless split-system air conditioning and heat pump units consisting of separate evaporator fan and compressor condenser components. Evaporator fan units are designed for ceiling or wall mounting. The compressor-condenser unit shall be remote and located on the roof where indicated on the Drawings.

B. Related Sections include the following:

1. Division 23 Section "Mechanical Vibration Isolation" for isolation pads.

1.3 DEFINITIONS

A. Evaporator-Fan Unit: The part of the ductless split-system air conditioning unit that contains a coil for cooling and a fan to circulate air to conditioned space.

B. Compressor-Condenser Unit: The part of the ductless split-system air conditioning unit that contains a refrigerant compressor and a coil for condensing refrigerant.

1.4 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For ductless split-system air conditioning units to include in maintenance manuals specified in Division 1.

D. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of ductless split-system units and are based on the specific system indicated. Other manufacturers' systems with equal performance characteristics may be considered.

B. Units shall be tested by a Nationally Recognized Testing Laboratory and shall bear the ETL label.

C. All wiring shall be in accordance with the governing version of the National Electrical Code.

D. Units shall be rated in accordance with ARI Standard 210 and bear the ARI Certification label.

E. Units shall be precharged with refrigerant for 70 feet of refrigerant tubing.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2013.

1.6 COORDINATION

A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 7 Section "Sheet Metal, Flashings and Roofing Accessories."

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: One year from date of Substantial Completion. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. Warranty does not include labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Daikin AC.
2. LG HVAC.
3. Mitsubishi Electric / Trane
4. Fujitsu

2.2 WALL-MOUNTED, EVAPORATOR-FAN COMPONENTS

A. The evaporator section shall be designed to be wall-mounted by means of a factory supplied mounting plate. Air distribution shall be integral to the wall-mounted unit.

B. Cabinet and Chassis: Cabinet shall be high strength molded plastic with front panel access for the filter. Cabinet color shall be white. Include drain pan with drain connection. Indoor unit shall be factory assembled, wired and tested. Contained within unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit in conjunction with the wall mounted controller shall have a self-diagnostic function, three minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant piping shall be purged with dry nitrogen before shipment from the factory.

C. Refrigerant Coil: Evaporator coil shall be nonferrous construction with pre-coated aluminum fins on copper tubing. All tube joints shall be brazed with silver alloy. Coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.

D. Fan and Motor: Evaporator fan shall be double inlet, forward curved, direct drive fan with a single motor. The fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall have two speeds: low and high.

E. Vane: Unit shall include a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall significantly decrease downward air resistance for lower noise levels and shall close when unit stops.

F. Filters: Return air shall be filtered with a removable and washable filter.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. General: Outdoor unit shall be the same capacity as the indoor unit and include a control board that interfaces with the indoor unit to perform all necessary operation functions. Outdoor unit shall be capable of operating at 0˚F ambient temperature without additional low ambient controls. Outdoor unit shall be able to operate with a maximum height difference of 100 feet from indoor unit to outdoor unit and a maximum refrigerant tubing length of 165 feet between the indoor and outdoor unit without the need for line size changes, traps, or additional oil.

B. Casing: Casing shall be galvanized steel plate coated with an electrostatically applied thermally fused acrylic or polyester powder coating. The fan grille shall be ABS plastic.

C. Compressor: The compressor shall be a DC rotary compressor with variable compressor speed inverter technology. The compressor shall be driven by inverter circuitry to control compressor speed. Compressor speed shall be varied to match space load. Outdoor unit shall include an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

D. Refrigerant Coil: Condenser coil shall be copper tubing with aluminum fins. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled

by means of linear expansion valve (LEV) metering orifice. The LEV shall be controlled by a microprocessor-controlled step motor.

E. Fan: The fan motor bearings shall be permanently lubricated. The fan shall have horizontal discharge airflow. The fan shall be mounted in front of the coil. The fan shall include a raised guard to prevent contact with moving parts.

2.4 ACCESSORIES

1. Control: The control system shall be microprocessor-based and include one microprocessor on the outdoor unit and one on the indoor unit. Wall-mounted controller shall a have a liquid crystal display indicating operating status and alarm condition and shall include a temperature sensor. A membrane keypad shall be included for program control and set point adjustment.
2. The controller shall consist of On/Off button, increase/decrease set temperature buttons, a cool/dry/fan mode selector, timer menu button, timer on/off button, set time buttons, fan speed selector, vane position selector, a ventilation button, a test run button, and a check mode button.
3. The controller shall display operating conditions such as set temperature, room temperature, pipe temperatures (i.e. liquid, discharge, indoor and outdoor), compressor operating conditions (including running current, frequency, input voltage, On/Off status and operating time), LEV opening pulses, sub-cooling and discharge super heat.
4. Normal operation of the controller shall provide individual system control in which one controller and one indoor unit are installed in the same room.
5. The control voltage from the controller to the indoor unit shall be 12 volts, DC. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Up to two wired controllers shall be able to be used to control one unit.
6. Control system shall control the continued operation of the air sweep louvers, as well as provide On/Off and mode switching. The controller shall have the capability to provide sequential starting with up to fifty seconds delay.

B. Refrigerant Line Sets: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends. Pre-charge line sets in proper lengths for application. Final length shall be field verified. Refer to section "Refrigerant Piping" for additional requirements.

C. Piping Jackets – Where refrigerant line sets are routed above the roof, provide an aluminum jacket to protect the refrigerant piping.

D. Factory-installed and –wired disconnect to be provided under this Section.

E. Condensate Pump: Provide where indicated in equipment schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, firmly anchored, in accordance with the manufacturer's written recommendations.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted compressor-condenser components on equipment supports specified in Division 7 Section "Sheet Metal, Flashings and Roofing Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Install compressor-condenser components on Elastomeric pads. Refer to Division 23 Section "Mechanical Vibration Controls."

E. Connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect condensate drain piping. Unit drain shall be internally trapped.

C. Install piping adjacent to unit to allow service and maintenance.

D. Unless otherwise indicated, connect piping with unions and shutoff valves to allow units to be disconnected without draining piping. Refer to piping system Sections for specific valve and specialty arrangements.

E. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Installation Inspection: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections, and to prepare a written report of inspection.

B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new components, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 238126

SECTION 238239 - UNIT HEATERS AND DUCT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and general provisions of the Contract Documents apply to this Section.

1.2 DEFINITIONS

A. BAS: Building automation system.

B. CWP: Cold working pressure.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluoroethylene plastic.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Location and size of each field connection.
3. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.
4. Location and arrangement of piping valves and specialties.
5. Location and arrangement of integral controls.
6. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2010, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2010 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 PROPELLER UNIT HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Airtherm; a Mestek Company.
2. Chromalox, Inc.; a division of Emerson Electric Company.
3. Indeeco.
4. Markel Products; a division of TPI Corporation.
5. Marley Electric Heating; a division of Marley Engineered Products.
6. QMark Electric Heating; a division of Marley Engineered Products.
7. Rosemex Products.
8. Trane.

B. Description: An assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.

C. Comply with UL 2021.

D. Cabinet: Removable panels for maintenance access to controls.

E. Cabinet Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heater before shipping.

F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

G. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.

H. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F at any point during normal operation.

1. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
2. Wiring Terminations: Stainless-steel or corrosion-resistant material.

I. Fan and Motor Board: Removable.

1. Fan: Aluminum propeller directly connected to motor.
2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Motors for HVAC Equipment."
3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

J. Basic Unit Controls:
1. Unit-mounted thermostat.

K. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall and ceiling unit heaters to comply with NFPA 90A.

B. Install wall and ceiling unit heaters level and plumb.

C. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers. Hanger rods and attachments to structure are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

A. Adjust initial temperature set points.

END OF SECTION 238239

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2 and 3 control cables.

1.3 DEFINITIONS

A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cerro Wire LLC.
2. General Cable; General Cable Corporation.
3. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for armored cable, Type AC metal-clad cable and Type MC with ground wire.

E. VFC Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. Hubbell Power Systems, Inc.
3. ILSCO.
4. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway or Type SE or Type USE multiconductor cable.

B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway Metal-clad cable and Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. VFC Output Circuits: Type XHHW-2 in metal conduit.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Branch Circuits Concealed in Casework: MC cable may be used to feed to outlet boxes fish concealed in built-in casework. Route cable supported tight in upper inside corners of casework, not in conflict with drawers or cabinet doors.

G. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

H. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

I. Whips from Junction Box Concealed in Ceilings to Lighting Fixtures:
   1. Type MC Cable or FMC, with minimum #12AWG copper THHN/THWN and full size equipment grounding conductor. Maximum whip length 72".
   2. MC Cable and FMC shall be supported within 24" of fixture connection so that whip is not in contact with ceiling or grid. Securing to fixture support wires with batwings is acceptable but not to ceiling support wires.
   3. Do not connect fixture whips from fixture to fixture (daisy chain). No more than 4 whips shall be connected to any one junction box.

J. All single-phase circuits shall include a dedicated neutral (grounded) and grounding conductor, unless specifically noted otherwise.
   1. The intent of this is to eliminate multiwire branch circuits and allow disconnection of one circuit without requiring disconnection of other(s) as would be required to comply with NEC 210.4(B). Per NEC 310.15(B)(b) each of these neutral (grounded) conductor is not considered to be load-bearing so derating is not required.

K. Contract drawings are based upon a maximum of 3 current-carrying conductors in a conduit. Contractor may rework indicated circuitry to install a maximum of (6) L-N circuits (120 V) in a single conduit. There shall be no more than 2 each A, B, C phase conductors per homerun. Each shall have dedicated neutral (grounded) conductor.
   1. Do not group L-L circuits in a homerun, unless specifically indicated on the drawings.
   2. Where there are more than 3 current-carrying conductors in a conduit, derate conductor ampacities in accordance with NEC Table 310.15(B)(2)(a).
   3. When running more than 3 ungrounded conductors in a raceway, increase size of conduits beyond those indicated in contract documents, as required to not exceed NEC Chapter 9, Table 1 conduit-fill requirements. As-built drawings shall clearly indicate which circuits are grouped in homeruns.

L. Unless otherwise indicated, minimum conductor size shall be 12 AWG.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.

3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.
3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Galvan Industries, Inc.; Electrical Products Division, LLC.
4. ILSCO.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.
2. Ductbank Grounding Conductor: Bury 12 inches above ductbank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Padmounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

G. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

H. Metallic Fences: Comply with requirements of IEEE C2.

1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system

ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches from building's foundation.

J. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

D. Grounding system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.

G. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper B-Line, Inc.; a division of Cooper Industries.
b. ERICO International Corporation.
c. Thomas & Betts Corporation.
d. Unistrut; an Atkore International company.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface. These are to be used only where specifically indicated on the drawings.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. Fabco Plastics Wholesale Limited.

2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) Hilti, Inc.
        2) MKT Fastening, LLC.
        3) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Hilti, Inc.
        3) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slottedsupport system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 9 for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Part 2 of this section includes material requirements for all raceways and boxes that may or may not be used on the project. Part 3 of this Section defines where a given type of product shall be or is permitted to be utilized.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Allied Tube & Conduit.
2. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
3. Robroy Industries.
4. Thomas & Betts Corporation.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT:

a. Material: Steel.
b. Type: Setscrew or compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. AFC Cable Systems, Inc.
2. Electri-Flex Company.
3. RACO; Hubbell.
4. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. LFNC: Comply with UL 1660.

E. Rigid HDPE: Comply with UL 651A.

F. RTRC: Comply with UL 1684A and NEMA TC 14.

G. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Fittings for LFNC: Comply with UL 514B.

I. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Moulded Products, Inc.
2. Hoffman; a brand of Pentair Equipment Protection.
3. Lamson & Sessions.

B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

E. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. EGS/Appleton Electric.
2. Erickson Electrical Equipment Company.
3. Hoffman; a brand of Pentair Equipment Protection.
4. Hubbell Incorporated.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
6. RACO; Hubbell.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

I. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

J. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

L. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

M. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

N. Gangable boxes are prohibited.

O. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Armorcast Products Company.
   b. Carson Industries LLC.
   c. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete or cast iron.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Armorcast Products Company.
   b. Carson Industries LLC.
   c. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Color of Frame and Cover: Gray.
4. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "ELECTRIC.".

8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
   1. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
   2. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: GRC.
   3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.

   4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   6. Damp or Wet Locations: GRC.
   7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. All conduit to be installed on exterior masonry shall not run continuously within the wall cavity.

I. Support conduit within 12 inches of enclosures to which attached.

J. Raceways Embedded in Slabs:

1. Are not permitted, except as required for entry into recessed floor boxes.
2. Conduits run below slab on ground floor level shall be buried within the porous fill and stub-up at the required location. Transition from RNC to RGS with RGS elbow before rising above the floor. After RGS elbow, stub-up conduit shall be type indicated in Part 3.1 above.
3. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to GRC before rising above floor.

K. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

M. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

T. Surface Raceways:

1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

U. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

V. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

W. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

X. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Y. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

Z. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements and also refer to Architectural elevations. Install boxes with height measured to center of box unless otherwise indicated.

AA. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

BB. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

CC. Locate boxes so that cover or plate will not span different building finishes.

DD. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

EE. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

FF. Set metal floor boxes level and flush with finished floor surface.

GG. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Concrete-encased conduit, ducts, and duct accessories.
3. Handholes and boxes.

1.3 DEFINITIONS

A. Traffic ways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include ductbank materials, including separators and miscellaneous components.
2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for manholes, handholes, boxes.
4. Include warning tape.
5. Include warning planks.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.
b. Include duct entry provisions, including locations and duct sizes.
c. Include reinforcement details.
d. Include frame and cover design and manhole frame support rings.
e. Include grounding details.
f. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
g. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

   a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
   b. Include duct entry provisions, including locations and duct sizes.
   c. Include cover design.
   d. Include grounding details.
   e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Ductbank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

   1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
   2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 FIELD CONDITIONS

A. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

B. Ground Water: Assume ground-water level is 36 inches below ground surface unless a higher water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

B. Install underground conduits and ductbanks per the table below. Locate a minimum of 3 feet from other utility systems (steam, chilled water, sewer, storm, etc.).

1. Install not less than 4- #4 reinforcing bars tied to a square cage at 8' centers for conduits in ductbank under roadways.
2. Concrete encased with a minimum envelope of 3" around each conduit *where encasement is required.*
3. Concrete shall be red dyed utilizing red dye mixed into the concrete for a minimum of 5 minutes prior to pouring. Minimum of 1 bag of dye per 1 yard of concrete.
4. Fire pump feeders shall be concrete encased PVC-Sched 40 below grade.

	Above 600V	600V and Below	Other Systems
Below Building Slabs	PVC-Sched 40 or GRS, 36" deep, red concrete encasement, 3000 psi	PVC-Sched 40 or GRS, *18*" deep, no concrete encasement required	PVC-Sched 40 or GRS, 24" deep, no concrete encasement required
Outside of Building Foot-print	PVC or GRS, 36" deep, red concrete encasement, 3000 psi	GRS, 36" deep, no encasement, or PVC, 24" deep with 2000 psi concrete encasement, no dye	GRS, 36" deep, no encasement, or PVC, 24" deep with 2000 psi concrete encasement, no dye (PVC-Sch 80 below auto traffic are-as)

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. ARNCO Corp.
2. Electri-Flex Company.
3. Lamson & Sessions.
4. Spiraduct/AFC Cable Systems, Inc.

B. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

C. Underground Plastic Utilities Duct: NEMA TC 6 & 8, ASTM F 512, UL 651A, Type HDPE and Type EB-20-PVC, with matching fittings complying with NEMA TC 9 by same manufacturer as the duct.

D. Underground Plastic Utilities Duct: NEMA TC 6 & 8, ASTM F 512, Type DB-60-PVC and Type DB-120-PVC, for direct burial, with matching fittings complying with NEMA TC 9 by same manufacturer as the duct.

E. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.

    a. Color: Red dye added to concrete during batching.
    b. Mark each plank with "ELECTRIC" in 2-inch- high, 3/8-inch- deep letters.

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Christy Concrete Products.
2. Oldcastle Precast, Inc.
3. Utility Concrete Products, LLC.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
2. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
3. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.

    a. Cover Hinges: Concealed, with hold-open ratchet assembly.
    b. Cover Handle: Recessed.

4. Frame and Cover: Weatherproof aluminum frame with hinged aluminum access door assembly with tamper-resistant, captive, cover-securing bolts.

    a. Cover Hinges: Concealed, with hold-open ratchet assembly.
    b. Cover Handle: Recessed.

5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

6. Cover Legend: Molded lettering, "ELECTRIC."
7. Configuration: Units shall be designed for flush burial and have closed bottom unless otherwise indicated.
8. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

    a. Extension shall provide increased depth of 12 inches.
    b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

9. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
10. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks, plus an additional 12 inches vertically and horizontally to accommodate alignment variations.

    a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
    b. Window opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
    c. Window openings shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.

11. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

    a. Type and size shall match fittings to duct or conduit to be terminated.
    b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

12. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have closed bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.

7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. Quazite: Hubbell Power Systems, Inc.

C. Fiberglass Handholes and Boxes with Polymer Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. Quazite: Hubbell Power Systems, Inc.
d. Synertech Moulded Products.

D. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers made of polymer concrete.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Carson Industries LLC.
b. Christy Concrete Products.
c. Nordic Fiberglass, Inc.
d. Quazite: Hubbell Power Systems, Inc.

E. High-Density Plastic Boxes: Injection molded of high-density polyethylene or copolymer-polypropylene. Cover shall be made of polymer concrete.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Carson Industries LLC.
b. Nordic Fiberglass, Inc.

c. Quazite: Hubbell Power Systems, Inc.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables More than 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

C. Underground Ducts Crossing Driveways and Roadways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-10 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf vertical loading.
5. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."

D. Cut and patch existing pavement in the path of underground ducts and utility structures according to the "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT INSTALLATION

A. Install ducts according to NEMA TCB 2.

B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations unless otherwise indicated.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

E. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, perform calculations showing the duct bank will not be subject to

environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.

F. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch.
3. Grout end bells into structure walls from both sides to provide watertight entrances.

G. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

H. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

I. Pulling Cord: Install 100-lbf- test nylon cord in empty ducts.

J. Concrete-Encased Ducts: Support ducts on duct separators.

1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches in nominal diameter.
2. Width: Excavate trench 12 inches wider than duct bank on each side.
3. Width: Excavate trench 3 inches wider than duct bank on each side.
4. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
5. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
6. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
7. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.

8. Elbows: Use manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Extend concrete encasement throughout length of elbow.
9. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

10. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
11. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
12. Concrete Cover: Install a minimum of 3 inches of concrete cover at top and bottom, and a minimum of 2 inches on each side of duct bank.
13. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
    b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.

14. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

K. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches in nominal diameter.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.

4. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

9. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

    a. Place minimum 3 inches of sand as a bed for duct bank. Place sand to a minimum of 6 inches above top level of duct bank.
    b. Place minimum 6 inches of engineered fill above concrete encasement of duct bank.

L. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.6 INSTALLATION OF CONCRETE HANDHOLES AND BOXES

A. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Manhole Roof: Install with rooftop at least 15 inches below finished grade.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
3. Install handholes with bottom below frost line, below grade.
4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
5. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

D. Dampproofing: Apply dampproofing to exterior surfaces of handholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Section 071113 "Bituminous Dampproofing." After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.

E. Hardware: Install removable hardware, including pulling eyes, cable stanchions,cable arms,as required for installation and support of cables and conductors and as indicated.

F. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

G. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches for manholes and 2 inches for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install handholes and boxes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
2. Dimensions: 10 inches wide by 12 inches deep.

3.8 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.10 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Advance Products & Systems, Inc.
b. Metraflex Company (The).
c. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

    a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."

b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using [**steel**] [**cast-iron**] pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260548 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic and wind forces required to select seismic and wind restraints and for designing vibration isolation bases.

a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Seismic- and Wind-Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
d. Preapproval and Evaluation Documentation: an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints. Electrical components include:

1. Control and monitoring panels.
2. Generators.
3. Luminaires.
4. Motor control centers.
5. Panelboards.
6. Photovoltaic system components.
7. Substations.
8. Switchboards.
9. Switchgear.
10. Transformers.
11. Unit substations.

B. Qualification Data: For testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed: 125.
2. Building Classification Category: IV.
3. Minimum 10 lb/sq. ft. multiplied by maximum area of component projected on vertical plane normal to wind direction and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: C.
2. Risk Building Category as Defined in the IBC: IV.
3. Component coefficients shall be in accordance with the ASCE 7.
4. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.221.
5. Design Spectral Response Acceleration at 1.0-Second Period: 0.084.

2.2 RESTRAINT CHANNEL BRACINGS

A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

A. Restraint Cables: ASTM A603 galvanized or ASTM A492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod.

B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and/or restraint cables.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

2.6 ADHESIVE ANCHOR BOLTS

A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.

C. Seismic controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's

wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."

D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Colors for Cables Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.5 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

C. Warning Tape:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
4. Weight: 28 lb/1000 sq. ft..
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
1. Warning labels and signs shall include, but are not limited to, the following:
   a. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   b. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES"
   c. Arc Flash Hazard Warning: Refer to Section 260574 for requirements.

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.10 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

I. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Concealed Raceways and Ductbanks, more Than 600 V, within Buildings: Tape and stencil 4-inch- wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot maximum intervals.

D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Grounded (Neutral): White.
5) Ground: Green.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Grounded (Neutral): Gray.
5) Ground: Green.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

F. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

I. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes or self-adhesive, self-laminating polyester labels with the conductor designation.

J. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

K. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

L. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

M. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

N. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

O. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

P. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer and load shedding.

Q. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

   a. Indoor Equipment: Adhesive film label with clear protective overlay. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchboards.
   e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   f. Emergency system boxes and enclosures.
   g. Enclosed switches.
   h. Enclosed circuit breakers.
   i. Enclosed controllers.
   j. Variable-speed controllers.
   k. Push-button stations.
   l. Power transfer equipment.
   m. Contactors.
   n. Remote-controlled switches, dimmer modules, and control devices.
   o. Power-generating units.
   p. Monitoring and control equipment.
   q. UPS equipment.

END OF SECTION 260553

SECTION 260572 - OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

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 a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals may be in digital form.

1. Short-circuit study input data, including completed computer program input data sheets.
2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary

submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. EDSA Micro Corporation.
2. Power Analytics, Corporation.
3. SKM Systems Analysis, Inc.

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.

G. Short-Circuit Study Output:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Calculated asymmetrical fault currents:

        1) Based on fault-point X/R ratio.
        2) Based on calculated symmetrical value multiplied by 1.6.
        3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. No AC Decrement (NACD) ratio.
    e. Equivalent impedance.
    f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
    g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.

1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Architect.
2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.

4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:

1. Electric utility's supply termination point.
2. Incoming switchgear.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.

6. Control panels.
7. Standby generators and automatic transfer switches.
8. Branch circuit panelboards.
9. Disconnect switches.

3.3 ADJUSTING

A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION 260572

SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

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 computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1. Study results shall be used to determine coordination of series-rated devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals may be in digital form.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and equipment evaluation reports.
3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. The following parts from the Protective Device Coordination Study Report:

1) One-line diagram.
2) Protective device coordination study.
3) Time-current coordination curves.

b. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member

company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers: Subject to compliance with requirements, provide software by one of the following:

1. ESA Inc.
2. Power Analytics, Corporation.
3. SKM Systems Analysis, Inc.

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

    a. Phase and Ground Relays:

        1) Device tag.
        2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
        3) Recommendations on improved relaying systems, if applicable.

    b. Circuit Breakers:

        1) Adjustable pickups and time delays (long time, short time, ground).
        2) Adjustable time-current characteristic.
        3) Adjustable instantaneous pickup.
        4) Recommendations on improved trip systems, if applicable.

    c. Fuses: Show current rating, voltage, and class.

G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

    a. Power utility's overcurrent protective device.
    b. Medium-voltage equipment overcurrent relays.
    c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
    e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.

f. Cables and conductors damage curves.
g. Ground-fault protective devices.
h. Motor-starting characteristics and motor damage points.
i. Generator short-circuit decrement curve and generator damage point.
j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Series rating on equipment allows the application of two series interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Both devices share in the interruption of the fault and selectivity is sacrificed at high fault levels. Maintain selectivity for tripping currents caused by overloads.
6. Provide adequate time margins between device characteristics such that selective operation is achieved.
7. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. The study shall be based on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

    a. Inrush current when first energized.
    b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
    c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

K. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:

1. Electric utility's supply termination point.
2. Switchgear.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.
6. Standby generators and automatic transfer switches.
7. Branch circuit panelboards.

M. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.

3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Architect.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).

16. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.
17. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    j. Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.
    k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.4 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

    1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.5 DEMONSTRATION

A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.
3. Adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION 260573

SECTION 260574 - OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

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 a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals may be in digital form.

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary

submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

B. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. EDSA Micro Corporation.
2. Power Analytics, Corporation.
3. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

G. Arc-Flash Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.

d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies:

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."
2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

C. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on the one-line diagram on Drawings. Call discrepancies to the attention of Architect.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.4 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:
   1. Low-voltage switchboard.
   2. Switchgear.
   3. Control panel.

3.5 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION 260574

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Indoor occupancy sensors.
4. Outdoor motion sensors.
5. Lighting contactors.
6. Emergency shunt relays.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Leviton Manufacturing Co., Inc.
4. NSi Industries LLC.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 20-A ballast load, 120-/240-V ac.
4. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
6. Astronomic Time: All channels.
7. Automatic daylight savings time changeover.
8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. NSi Industries LLC.
4. Tyco Electronics.

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
3. Time Delay: Fifteen second minimum, to prevent false operation.

4. Surge Protection: Metal-oxide varistor.
5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

C. Description: Solid state, with SPST dry contacts rated for 1800 VA, to operate connected load, complying with UL 773.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Lightning Arrester: Air-gap type.
5. Mounting: Twist lock complying with NEMA C136.10, with base.

2.3 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hubbell Building Automation, Inc.
2. Leviton Manufacturing Co., Inc.
3. Lithonia Lighting; Acuity Brands Lighting, Inc.
4. Lutron Electronics Co., Inc.
5. Sensor Switch, Inc.
6. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage:
   a. **Standard Height Units**: In areas that have ceiling heights of 12 feet or lower, provide Watt Stopper unit DT-300 (or approved equal): Detect occupancy anywhere within a circular area up to 2000 square feet. Detectors shall be networkable to allow coverage of larger or irregularly shaped areas.
   b. **High Ceiling Units**: In areas that have ceiling/mounting height over 12 feet up to 40 foot mounting provide Watt Stopper unit HB3x0 with L4 lens, or approved equal. Detect occupancy anywhere within a circular area up to 3500 square feet. Detectors shall be networkable to allow coverage of larger or irregularly shaped areas.

2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hubbell Building Automation, Inc.
2. Leviton Manufacturing Co., Inc.
3. Lutron Electronics Co., Inc.
4. Sensor Switch, Inc.
5. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor 180 degree:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP, dual circuit.
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

D. Wall-Switch Sensor 210 degree:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: PIR.
3. Switch Type: SP, dual circuit.
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.5 OUTDOOR MOTION SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hubbell Building Automation, Inc.
2. Leviton Manufacturing Co., Inc.
3. Sensor Switch, Inc.
4. Watt Stopper.

B. General Requirements for Sensors: Solid-state outdoor motion sensors.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Dual-technology (PIR and infrared) type, weatherproof. Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.. Comply with UL 773A.
3. Switch Rating:

   a. Lighting-Fixture-Mounted Sensor: 500-VA fluorescent or LED.
   b. Separately Mounted Sensor: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.

4. Switch Type: SP, dual circuit.
5. Voltage: Dual voltage, 120- and 277-V type.
6. Detector Coverage:

    a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft.
    b. Long Range: 180-degree field of view and 110-foot detection range.

7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
8. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
9. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
10. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and help eliminate false "off" switching.
11. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F, rated as "raintight" according to UL 773A.

2.6 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP.
3. General Electric Company.
4. Square D.

B. Description: Electrically operated and mechanically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

C. Interface with DDC System for HVAC: Provide hardware interface to enable the DDC system for HVAC to monitor and control lighting contactors.

2.7 EMERGENCY SHUNT RELAY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Lighting Control and Design.
2. Watt Stopper.

B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.

1. Coil Rating: 120 V.

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller thanNo. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide one visit to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262413 – SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Disconnecting and overcurrent protective devices.
3. Instrumentation.
4. Control power.
5. Accessory components and features.
6. Identification.

1.3 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
9. Include schematic and wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Routine maintenance requirements for switchboards and all installed components.
b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) to prevent condensation.

C. Handle and prepare switchboards for installation according to NEMA PB 2.1.

1.8 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 104 deg F.
    b. Altitude: Not exceeding 6600 feet.

1.9 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buss, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SWITCHBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Power Transmission & Distribution, Inc.
4. Square D; by Schneider Electric.

B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. All feeder breakers in switchboards shall have LSI (long time, short time and instantaneous) settings.

D. All panelboards, switchboards, circuit breakers, dry type transformers and disconnect switches shall be of the same manufacturer.

E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

F. 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.

G. Comply with NEMA PB 2.

H. Comply with NFPA 70.

I. Comply with UL 891.

J. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

K. Nominal System Voltage: 208Y/120 V.

L. Main-Bus Continuous: 1000A.

M. Indoor Enclosures: Steel, NEMA 250, Type 1

N. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

O. Barriers: Between adjacent switchboard sections.

P. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

Q. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

R. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

S. Customer Metering Compartment: A separate customer metering compartment and section with front hinged door, for indicated metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks. Include potential transformers having primary and secondary fuses with disconnecting means and secondary wiring terminated on terminal blocks.

T. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

U. Removable, Hinged Rear Doors and Compartment Covers: Secured by captive thumb screws, for access to rear interior of switchboard.

V. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

W. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity.
3. Copper feeder circuit-breaker line connections.
4. Ground Bus: Minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
5. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
6. Disconnect Links:
   a. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
7. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
8. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

X. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

Y. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components including instruments and instrument transformers.

2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long and short time adjustments.
   d. Ground-fault pickup level, time delay, and I^2t response.
2. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
3. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
d. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
g. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

B. Insulated-Case Circuit Breaker (ICCB): 100 percent rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Standard-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:

a. Instantaneous trip.
b. Time adjustments for long- and short-time pickup.
c. Ground-fault pickup level, time delay, and I^2t response.

4. Communication Capability: Web enabled integral Ethernet communication module and embedded Web server with factory-configured Web pages (HTML file format). Provide functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
5. Control Voltage: 120-V ac.

2.3 INSTRUMENTATION

A. Instrument Transformers: NEMA EI 21.1, and the following:

1. Potential Transformers: NEMA EI 21.1; 120 V, 60 Hz, single secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
2. Current Transformers: NEMA EI 21.1; 5 A, 60 Hz, secondary; wound type; single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
d. Megawatts: Plus or minus 1 percent.
e. Megavars: Plus or minus 1 percent.
f. Power Factor: Plus or minus 1 percent.
g. Frequency: Plus or minus 0.1 percent.
h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
j. Contact devices to operate remote impulse-totalizing demand meter.

2. Mounting: Display and control unit flush or semi-flush mounted in instrument compartment door.

2.4 CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.

B. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

C. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.5 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.

1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.

2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
3. Protect from moisture, dust, dirt, and debris during storage and installation.
4. Install temporary heating during storage per manufacturer's instructions.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to switchboards.
6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

D. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

E. Install filler plates in unused spaces of panel-mounted sections.

F. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

G. Comply with NECA 1.

3.3 CONNECTIONS

A. Comply with requirements for terminating feeder bus specified in Section 262500 "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.

B. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.

C. Support and secure conductors within the switchboard according to NFPA 70.

D. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:

1. Acceptance Testing:

    a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
    b. Test continuity of each circuit.

2. Test ground-fault protection of equipment for service equipment per NFPA 70.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Switchboard will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories, and to use and reprogram microprocessor-based trip, monitoring, and communication units.

END OF SECTION 262413

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. SPD: Surge Protection Device.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.5 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

B. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.9 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.10 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

B. All panelboards, switchboards, circuit breakers, dry type transformers and disconnect switches shall be of the same manufacturer.

C. Enclosures: Flush and surface-mounted cabinets as indicated on the drawings.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    b. Outdoor Locations: NEMA 250, Type 3R.
    c. Wet or Damp Indoor Locations: NEMA 250, Type 4.
    d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
2. Piano Type Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
3. Finishes:

    a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Galvanized steel.
    c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

4. Directory Card: Inside panelboard door, mounted in transparent card holder.

D. Incoming Mains Location: Top or bottom to match incoming conduit location.

E. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
5. Split Bus: Vertical buses divided into individual vertical sections.

F. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

I. All doors shall be keyed alike.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.3 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit breaker or Lugs only per drawings.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Siemens Industry, Inc.
2. General Electric Company.
3. Square D.
4. Eaton Electrical Sector; Eaton Corporation.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only per the drawings.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I squared x t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

e. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
h. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
i. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
j. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
k. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
l. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.
n. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses: Comply with requirements specified in Section 262813 "Fuses."
2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.
3. Auxiliary Contacts: Two normally open and normally closed contact(s) that operate with switch handle operation.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Equipment Mounting: Install panelboards on concrete bases, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

D. 90 inches to top of trim above finished floor unless otherwise indicated or as required to ensure that the operating handle of the top most switch or circuit breaker is not higher than 79" above the finished floor level.

E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

G. Install filler plates in unused spaces.

H. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262714 - UTILITY SERVICE ENTRANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and general provisions of the Contract Documents apply to the work of this section.

1.2 SUMMARY

A. This Section includes work required to allow Utility Company to provide power to the project, as well as provisions for Utility Company metering & CT.

B. The Owner will pay all charges levied by the Power Company for the underground service. The Contractor shall assist the Owner with the application for electrical service.

C. The power company will furnish 208/120 volt, three phase, 4-wire, 60-Hz underground service.

1.3 COORDINATION

A. Electrical service will be supplied by Rappahannock Electric Cooperative, herein referred to as "the power company."

B. All work shall be in accordance with the Rappahannock Electric Cooperative requirements.

C. Coordinate work with the power company within 30 days of notice to proceed. Notification shall be in writing with a brief construction schedule included. Provide the name and telephone number of contact person (installation supervisor). Subsequent to notification, schedule a preconstruction meeting be held at the power company's District Office or other location and time acceptable to the power company. Representatives of the general Contractor and appropriate sub-contractors shall attend. A power company Construction Department representative will review the proposed construction schedule and discuss any construction practices and/or methods applicable to the project. No work shall commence until construction schedule and ductbank installation drawings are approved by the power company.

D. The Contractor shall notify the power company at least seven days prior to beginning of duct bank construction.

E. Equipment fault current ratings shown on the documents are based on preliminary information provided by the Power Company and are shown for bidding purposes only. Exact available fault current values at the service connection point will be determined by the Power Company after the project is awarded. Verify equipment fault current interrupting capacity requirements prior to ordering electrical distribution equipment in accordance with Section 260572 "Overcurrent Protective Device Short Circuit Study." Provide a copy of the Power Company's calculated maximum available fault current to the Architect.

PART 2 - PRODUCTS

2.1 SPECIFICATION

A. Products required by this Section are specified in other Sections, or are furnished/specified by the Utility Company.

2.2 UTILITY COMPANY PROVIDED WORK AND MATERIALS

A. Pad mounted transformer with CT and meter.

B. Primary conductors and terminations to the transformer.

C. Cable terminations at secondary bushings of transformer.

D. Conduit seal on the transformer end of Contractor -provided conduits to company transformer.

E. Metering circuitry from CT Cabinet to meter.

2.3 CONTRACTOR PROVIDED WORK AND MATERIALS

A. Excavation and backfill for primary and secondary service ductbanks.

B. Conduit ductbank for Utility Company primary conductors to transformer.

C. Transformer pad as directed by Utility Company.

D. Grounding at service entrance and transformer pad.

E. Service switchboard.

F. Ductbank from utility pad mounted transformer to service switchboard, with conductors terminated in switchboard.

G. Conduit seals in accordance with Utility Company requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All work shall be in accordance with Rappahannock Electric Cooperative requirements.

B. Upon completion of duct bank installation, cap ends of conduits to prevent entry of debris. Provide 500 pound stress polyolefin pull lines in all conduits to accommodate the pulling of cables. Prior to Contractor or power company conductor installation, Contractor shall rod all conduits with a

mandrel having a diameter of 1/4 inch less than the bore diameter of the conduit, and brush full length with a stiff wire brush.

C. Furnish two (2) copies of as-built drawings showing the actual location and installation of the duct bank to the power company.

D. Backfilling shall be compacted to achieve at least a modified Proctor 95 rating.

END OF SECTION 262713

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Isolated-ground receptacles.
4. Weather-resistant receptacles.
5. Snap switches and wall-box dimmers.
6. Solid-state fan speed controls.
7. Wall-switch and exterior occupancy sensors.
8. Communications outlets.
9. Pendant cord-connector devices.
10. Cord and plug sets.
11. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. SPD: Surge Protective Device.

F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cooper Wiring Devices, Inc.
2. Hubbell.
3. Leviton Manufacturing Co., Inc.
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Cooper Wiring Devices, Inc.
    b. Hubbell.
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour/Legrand (Pass & Seymour).

B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Cooper Wiring Devices, Inc.
    b. Hubbell.
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Cooper Wiring Devices, Inc.
    b. Hubbell.
    c. Leviton Manufacturing Co., Inc.

d. Pass & Seymour/Legrand (Pass & Seymour).

2.5 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper Wiring Devices, Inc.
b. Hubbell.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper Wiring Devices, Inc.
b. Hubbell.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

2. Description:

a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.

2.7 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Single Pole:

1) Cooper; AH1221.
2) Hubbell; HBL1221.
3) Leviton; 1221-2.
4) Pass & Seymour; CSB20AC1.

b. Two Pole:

1) Cooper; AH1222.
2) Hubbell; HBL1222.
3) Leviton; 1222-2.
4) Pass & Seymour; CSB20AC2.

c. Three Way:

1) Cooper; AH1223.
2) Hubbell; HBL1223.
3) Leviton; 1223-2.
4) Pass & Seymour; CSB20AC3.

d. Four Way:

1) Cooper; AH1224.
2) Hubbell; HBL1224.
3) Leviton; 1224-2.
4) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Cooper Wiring Devices, Inc.
    b. Hubbell.
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

2.9 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

1. 600 W; dimmers shall require no derating when ganged with other devices. Illuminated when "off."

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

E. LED Dimmer Switches: Modular; compatible with dimmer drivers; trim potentiometer to adjust low-end dimming; dimmer-driver combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.10 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.11 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, die-cast aluminum solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for UTP cable complying with requirements in Section 271500 "Communications Horizontal Cabling."

2.12 POKE-THROUGH ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hubbell.
2. Pass & Seymour/Legrand (Pass & Seymour).
3. Square D; by Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold / Legrand.

B. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
3. Service-Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks complying with requirements in Section 271500 "Communications Horizontal Cabling."
4. Size: Selected to fit nominal 4-inch cored holes in floor and matched to floor thickness.
5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
6. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.
7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables that comply with requirements in Section 271500 "Communications Horizontal Cabling."

2.13 PREFABRICATED MULTIOUTLET ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hubbell.

2. Wiremold / Legrand.

B. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

D. Multioutlet Harness:

1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
2. Receptacle Spacing: 12 inches.
3. Wiring: No. 12 AWG solid, Type THHN copper, single circuit.

2.14 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. SPD Devices: Blue.
4. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Test Instruments: Use instruments that comply with UL 1436.
   2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Panelboards.
c. Switchboards.
d. Enclosed controllers.
e. Enclosed switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in electronic format suitable for use in coordination software and in PDF format.
5. Coordination charts and tables and related data.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in electronic format suitable for use in coordination software and in PDF format.
4. Coordination charts and tables and related data.

1.5 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cooper Bussmann; a division of Cooper Industries.
2. Edison; a brand of Cooper Bussmann; a division of Cooper Industries.
3. Littelfuse, Inc.

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type CC: 600-V, zero- to 30-A rating, 200 kAIC , time delay.
3. Type J: 600-V, zero- to 600-A rating, 200 kAIC.
4. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class L, time delay.
2. Feeders: Class RK1, time delay.
3. Motor Branch Circuits: Class RK5, time delay.
4. Large Motor Branch (601-4000 A): Class L, time delay.
5. Power Electronics Circuits: Class J, high speed.
6. Other Branch Circuits: Class RK1, time delay.
7. Control Transformer Circuits: Class CC, time delay, control transformer duty.
8. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Molded-case circuit breakers (MCCBs).
5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

B. Manufacturer's field service report.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.

1.9 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 All panelboards, switchboards, circuit breakers, dry type transformers and disconnect switches shall be of the same manufacturer.

2.2 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D.

B. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.

6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.
9. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.3 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D.

B. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.
7. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

H. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

I. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system, specified in Section 260913 "Electrical Power Monitoring and Control."
6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
8. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
11. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
12. Electrical Operator: Provide remote control for on, off, and reset operations.
13. Accessory Control Power Voltage: Integrally mounted, self-powered.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Wet or Damp, Indoor Locations: NEMA 250, Type 4.
4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges.

END OF SECTION 262816

SECTION 262913 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following enclosed controllers rated 600 V and less:

1. Full-voltage manual.
2. Full-voltage magnetic.
3. Reduced-voltage magnetic.
4. Reduced-voltage solid state.
5. Multispeed.

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. N.C.: Normally closed.

E. N.O.: Normally open.

F. OCPD: Overcurrent protective device.

G. SCR: Silicon-controlled rectifier.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Nameplate legends.
d. Short-circuit current rating of integrated unit.
e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to authorities having jurisdiction.
f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.

2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

C. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for enclosed controllers and installed components.
2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
3. Manufacturer's written instructions for setting field-adjustable overload relays.
4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage solid-state controllers.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install temporary electric heating, with at least 250 W per controller.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electrical Systems: Do not interrupt electrical systems in facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of electrical systems.
2. Indicate method of providing temporary utilities.
3. Do not proceed with interruption of electrical systems without Owner's written permission.
4. Comply with NFPA 70E.

1.10 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 FULL-VOLTAGE CONTROLLERS

A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Eaton Electrical Sector; Eaton Corporation.
b. General Electric Company.
c. Siemens Industry, Inc.
d. Square D.

2. Configuration: Nonreversing.
3. Surface mounting.
4. Red pilot light.

C. Fractional Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Eaton Electrical Sector; Eaton Corporation.
b. General Electric Company.
c. Siemens Industry, Inc.
d. Square D.

2. Configuration: Nonreversing.
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.
4. Surface mounting.
5. Red pilot light.

D. Integral Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Eaton Electrical Sector; Eaton Corporation.
b. General Electric Company.
c. Siemens Industry, Inc.
d. Square D.

2. Configuration: Nonreversing.
3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters and sensors in each phase, matched to nameplate full-load current of actual protected motor and having appropriate adjustment for duty cycle; external reset push button; bimetallic type.
4. Surface mounting.
5. Red pilot light.

E. Magnetic Controllers: Full voltage, across the line, electrically held.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Eaton Electrical Sector; Eaton Corporation.
b. General Electric Company.
c. Siemens Industry, Inc.
d. Square D.

2. Configuration: Nonreversing.
3. Contactor Coils: Pressure-encapsulated type.

a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.

a. CPT Spare Capacity: 200 VA.

6. Melting Alloy Overload Relays:

a. Inverse-time-current characteristic.
b. Class 10 tripping characteristic.
c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

7. Bimetallic Overload Relays:

a. Inverse-time-current characteristic.
b. Class 10 tripping characteristic.

c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
d. Ambient compensated.
e. Automatic resetting.

8. Solid-State Overload Relay:

a. Switch or dial selectable for motor running overload protection.
b. Sensors in each phase.
c. Class 10 tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
e. Analog communication module.

9. N.O., isolated overload alarm contact.
10. External overload reset push button.

F. Combination Magnetic Controller: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Eaton Electrical Sector; Eaton Corporation.
b. General Electric Company.
c. Siemens Industry, Inc.
d. Square D.

2. Fusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class R fuses.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

3. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.
4. Nonfusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

5. MCP Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-

mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
d. N.O. alarm contact that operates only when MCP has tripped.
e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

6. MCCB Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.

2.2 ENCLOSURES

A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Outdoor Locations: Type 3R.
3. Wet or Damp Indoor Locations: Type 4.
4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

2.3 ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, oiltight type.

a. Push Buttons: Covered types; maintained as indicated.
b. Pilot Lights: LED types; colors as indicated; push to test.
c. Selector Switches: Rotary type.

2. Elapsed Time Meters: Heavy duty with digital readout in hours; nonresettable.
3. Meters: Panel type, 2-1/2-inch minimum size with 90- or 120-degree scale and plus or minus two percent accuracy. Where indicated, provide selector switches with an off position.

B. N.O. auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

E. Breather and drain assemblies, to maintain interior pressure and release condensation in Type 4 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

F. Space heaters, with N.C. auxiliary contacts, to mitigate condensation in Type 3R enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

G. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

H. Cover gaskets for Type 1 enclosures.

I. Spare control wiring terminal blocks, quantity as indicated ; wired.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

B. Floor-Mounted Controllers: Install enclosed controllers on 4-inch nominal-thickness concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in each fusible-switch enclosed controller.

E. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."

F. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

G. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices.

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation.
2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Owner before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload-relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Owner before increasing settings.

D. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage solid-state controllers.

END OF SECTION 262913

SECTION 263213 - ENGINE GENERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes packaged engine-generator sets for emergency power supply with the following features:

1. Gas engine.
2. Unit-mounted cooling system.
3. Unit-mounted and remote-mounted control and monitoring.
4. Performance requirements for sensitive loads.
5. Fuel system.
6. Parallel generator sets.
7. Load banks.
8. Outdoor enclosure.

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. LP: Liquid petroleum.

C. EPS: Emergency power supply.

D. EPSS: Emergency power supply system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour at 0.5, 0.75 and 1.0 times generator capacity.
5. Include generator efficiency at at 0.5, 0.75 and 1.0 times generator capacity.

6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor, with air supply temperature of 95, 80, 70, and 50 deg F. Provide drawings showing requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to kw rating, efficiency, reactances, and short-circuit current capability.
8. Fuel-Tank Capacity Calculation: Demonstrate the fuel tank contains a minimum of 133 percent of total fuel required for the hours of continuous operation for indicated EPSS class

B. Shop Drawings:

1. Include plans and elevations for engine-generator set and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases. Only required for seismic certified units.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

C. Coordination Study Report: The findings of the Section 260573 Coordination Study Report (CSR) may affect the overcurrent protective devices and fault-current withstand requirements for switchboards, panelboards, generator breakers and transfer switches. Also, the preparation of the CSR is dependent on the manufacturer's data for this equipment. Therefore, until Submittal final Approval is granted for the CSR, these materials shall be considered at best "Approved, pending Approval of the CSR" and not released for order.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

    a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
    b. Operating instructions laminated and mounted adjacent to generator location.
    c. Training plan.
    d. Warranty.

1.6 SUBSTITUTIONS

The generator system has been designed to the Basis of Design manufacturer's electrical and physical characteristics. The equipment sizing, spacing, amounts, electrical wiring, ventilation equipment, fuel, and exhaust and other physical and electrical components have all been sized and designed around Caterpillar supplied equipment. Should any other manufacturer's equipment be submitted for use on the project, the equipment provider shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs, which may result. Other generator manufacturers are known to produce equipment capable of meeting the functional requirements of this section but have not been evaluated to confirm they are compatible with the space limitations or any other installation requirements that may differ from the Basis of Design Equipment.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within One year from date of Final Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Kohler Power Systems (basic of design).
   2. Generac Power Systems, Inc.
   3. Caterpillar; Engine Div.
   4. Onan/Cummins Power Generation; Industrial Business Group.
   5. MTU Onsite Energy

B. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. ASME Compliance: Comply with ASME B15.1.

B. Comply with EPA emission standards for reciprocating internal combustion engines (RICE).

C. NFPA Compliance:
   1. Comply with NFPA 37.
   2. Comply with NFPA 70.
   3. Comply with NFPA 110 requirements for Level 1 emergency power supply system.

D. UL Compliance: Comply with UL 2200.

E. Engine Exhaust Emissions: Comply with EPA Tier 2 requirements and applicable state and local government requirements.

F. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

G. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 5 to 40 deg C.
2. Altitude: Sea level to 1000 feet.

H. Unusual Service Conditions: Engine-generator equipment and installation are required to operate under the following conditions:

2.3 ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

C. EPSS Class: Engine-generator set shall be classified as a Class 48 in accordance with NFPA 110.

D. Governor: Adjustable isochronous, with speed sensing.

E. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

F. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
2. Output Connections: Three-phase, four wire.
3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

G. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: Comply with NFPA 110, Type 10, system requirements.
9. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
10. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
11. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
12. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
13. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
14. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
15. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

    a. Provide permanent magnet excitation for power source to voltage regulator.

16. Start Time: Comply with NFPA 110, Type 10, system requirements.

H. Sound Attenuation:
   1. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 78 dBA or less.

2.4 ENGINE

A. Fuel: Natural Gas

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.

D. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

F. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
1. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
2. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
4. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 24-V electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.

5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.
9. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 GASEOUS FUEL SYSTEM

A. Natural-Gas Piping: Comply with requirements in Section 231123 "Facility Natural-Gas Piping."

B. LP-Gas Piping: Comply with requirements in Section 231126 "Facility Liquefied-Petroleum Gas Piping."

C. Gas Train: Comply with NFPA 37.

D. Engine Fuel System:

1. Natural Gas, Vapor-Withdrawal System:

    a. Carburetor.
    b. Secondary Gas Regulators: One for each fuel type, with atmospheric vents piped to building exterior.

c. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves; one for each fuel source.
d. Fuel Filters: One for each fuel type.
e. Manual Fuel Shutoff Valves: One for each fuel type.
f. Flexible Fuel Connectors: Minimum one for each fuel connection.

2.6 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.

B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.

C. Provide minimum run time control set for 30 minutes with override only by operation of a remote emergency-stop switch.

D. Comply with UL 508A.

E. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Panel shall be powered from the engine-generator set battery.

F. Indicating Devices: As required by NFPA 110 for Level 1 system, including the following:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. EPS supplying load indicator.
5. Ammeter and voltmeter phase-selector switches.
6. DC voltmeter (alternator battery charging).
7. Engine-coolant temperature gage.
8. Engine lubricating-oil pressure gage.
9. Running-time meter.
10. Current and Potential Transformers: Instrument accuracy class.

G. Protective Devices and Controls in Local Control Panel: Shutdown devices and common visual alarm indication as required by NFPA 110 for Level 1 system, including the following:

1. Start-stop switch.
2. Overcrank shutdown device.
3. Overspeed shutdown device.
4. Coolant high-temperature shutdown device.

5. Coolant low-level shutdown device.
6. Low lube oil pressure shutdown device.
7. Air shutdown damper shutdown device when used.
8. Overcrank alarm.
9. Overspeed alarm.
10. Coolant high-temperature alarm.
11. Coolant low-temperature alarm.
12. Coolant low-level alarm.
13. Low lube oil pressure alarm.
14. Air shutdown damper alarm when used.
15. Lamp test.
16. Contacts for local and remote common alarm.
17. Coolant high-temperature prealarm.
18. Generator-voltage adjusting rheostat.
19. Main fuel tank low-level alarm.

    a. Low fuel level alarm shall be initiated when the level falls below that required for operation for the duration required in "Fuel Tank Capacity" Paragraph in "Diesel Fuel-Oil System" Article.

20. Run-Off-Auto switch.
21. Control switch not in automatic position alarm.
22. Low cranking voltage alarm.
23. Battery-charger malfunction alarm.
24. Battery low-voltage alarm.
25. Battery high-voltage alarm.
26. Generator overcurrent protective device not closed alarm.

H. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

I. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Coolant low-temperature alarm.
3. High engine temperature prealarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.

11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Lamp test.
18. Low cranking voltage alarm.
19. Generator overcurrent protective device not closed.

J. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

K. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

L. Connection to Datalink: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication. Provide connections for datalink transmission of indications to remote data terminals via ModBus.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.

1. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Circuit Breaker: Molded-case, type; 100 percent rated; complying with UL 489.
1. All breakers feeding panelboards on the life safety, legally required and optional standby systems shall be LSI (long time, short time and instantaneous) mission critical breakers. Upsize the breaker frame size as required.
2. AIC rating shall match the breaker suppling the ATS from the normal utility supply
3. Tripping Characteristic: Designed specifically for generator protection.
4. Trip Rating: Matched to generator output rating.
5. Mounting: Adjacent to or integrated with control and monitoring panel.

C. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.

2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

D. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.
1. Trip generator protective device on ground fault.

E. If output circuit breaker(s) and/or generator controls are located more than 6'-6" above the finished grade and/or are not readily accessible and with clearances as required by the NEC, provide all necessary work and materials including but not limited to ramps, stairs, and platforms required to achieve compliance with the conditions above. All provisions shall conform to OSHA, state and local safety requirements including but not limited to handrails, markings, signage, and access barriers.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required..

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Dripproof.

G. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
2. Maintain voltage within 15 percent on one step, full load.
3. Provide anti-hunt provision to stabilize voltage.

H. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

2.9 LOAD BANK (When indicated on the drawings)

A. Description: Permanent, outdoor, weatherproof, radiator mounted remote-controlled, forced-air-cooled, resistive unit capable of providing a balanced three-phase, delta-connected load to generator set at 100 percent rated-system capacity, at 80 percent power factor, lagging. Unit shall be capable of selective control of load in 25 percent steps and with minimum step changes of approximately 5 and 10 percent available.

B. Resistive Load Elements: Corrosion-resistant chromium alloy with ceramic and stainless-steel supports. Elements shall be double insulated and designed for repetitive on-off cycling. Elements shall be mounted in removable aluminized-steel heater cases. Galvanized steel is prohibited. Element's maximum resistance shall be between 100 and 105 percent of rated resistance.

C. Load-Bank Heat Dissipation: Integral fan with totally enclosed motor shall provide uniform cooling airflow through load elements. Airflow and coil operating current shall be such that, at maximum load, with ambient temperature at the upper end of specified range, load-bank elements operate at not more than 50 percent of maximum continuous temperature rating of resistance elements.

D. Load-Element Switching: Remote-controlled contactors switch groups of load elements. Contactor coils are rated 120 V. Contactors shall be located in a separate NEMA 250, Type 3R enclosure within load-bank enclosure, accessible from exterior through hinged doors with tumbler locks.

E. Contactor Enclosures: Heated by thermostatically controlled strip heaters to prevent condensation.

F. Load-Bank Enclosures: NEMA 250, Type 3R, aluminized steel complying with NEMA ICS 6. Louvers at cooling-air intake and discharge openings shall prevent entry of rain and snow. Openings for airflow shall be screened with 1/2-inch- square, galvanized-steel mesh. Load bank shall include automatic shutters at air intake and discharge. Components other than resistive elements shall receive exterior epoxy coating with compatible primer.

G. Protective Devices: Power input circuits to load banks shall be fused, and fuses shall be selected to coordinate with generator circuit breaker. Fuse blocks shall be located in contactor enclosure. Cooling airflow and overtemperature sensors shall automatically shut down and lock out load bank until manually reset. Safety interlocks on access panels and doors shall disconnect load power, control, and heater circuits. Fan motor shall be separately protected by overload and short-circuit devices. Short-circuit devices shall be noninterchangeable fuses with 200,000 A interrupting capacity.

2.10 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

B. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.
3. Ventilation: Provide temperature-controlled exhaust fan interlocked to prevent operation when engine is running.

C. Enclosure Heater: Electric, factory to comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

D. Provide unit battery powered emergency lighting fixture within the weatherproof enclosure interior

2.11 MOTORS

A. Description: NEMA MG 1, Design B, medium induction random-wound, squirrel cage motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

E. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

F. Temperature Rise: Match insulation rating.

G. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

H. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

I. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in electrical Sections.

2.12 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient

stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

B. Comply with requirements in Section 232116 Hydronic Piping Specialties" for vibration isolation and flexible connectors materials for steel piping.

C. Comply with requirements in Section 233113 "Metal Ducts" for vibration isolation and flexible connector materials for exhaust shroud and ductwork.

D. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.13 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.14 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdown.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than ten working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

3.3 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations."
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
3. Provide the pad to include the overall footprint of the generator with stair and fuel tank plus 12" on all sides. Coordination pad opening with the manufacturer. Refer to the detail on the structural drawing for pad construction.

C. Install packaged engine-generator to provide access, without removing connections or accessories, for periodic maintenance.

D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine-generator to allow service and maintenance.

C. Connect engine exhaust pipe to engine with flexible connector.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90 degree bend in flexible conduit routed to the generator set from a stationary element.

F. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs as specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.

a. Visual and Mechanical Inspection

1) Compare equipment nameplate data with drawings and specifications.
2) Inspect physical and mechanical condition.
3) Inspect anchorage, alignment, and grounding.
4) Verify the unit is clean.

b. Electrical and Mechanical Tests

1) Perform insulation-resistance tests in accordance with IEEE 43.

a) Machines larger than 200 horsepower. Test duration shall be 10 minutes. Calculate polarization index.
b) Machines 200 horsepower or less. Test duration shall be one minute. Calculate the dielectric-absorption ratio.

2) Test protective relay devices.

3) Verify phase rotation, phasing, and synchronized operation as required by the application.
4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
5) Conduct performance test in accordance with NFPA 110.
6) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test. Complete the form attached in part 4. A digital copy (PDF or excel) is available from the Architect by request. Include the completed test form in the O& M manual.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

   a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
   b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
   c. Verify acceptance of charge for each element of the battery after discharge.
   d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust Emissions Test: Comply with applicable government test criteria.
7. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases and verify that performance is as specified.
8. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
9. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations 25 feet from edge of the generator enclosure , and compare measured levels with required values.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

K. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

L. Upon completion of testing, provide a full tank of fuel within all provided fuel tanks.

3.7 WARRANTY

A. Warranty Period: Provide a warranty to repair or replace for five years from date of Final Acceptance.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.
2. Remote annunciation systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

C. Short Circuit Study Report: The findings of the Section 260572 Overcurrent Protective Device Short Circuit Study may affect the overcurrent protective devices and fault-current withstand requirements for switchboards, panelboards, and transfer switches. Also, the preparation of the study is dependent upon the manufacturer's data for this equipment. Therefore until Submittal final Approval is granted for the study, these materials shall be considered at best "Approved, pending Approval of the stdy" and not released for order.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches and remote annunciators through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 99.

G. Comply with NFPA 110.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.7 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Owner no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Contactor Transfer Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Kohler Power Systems.
b. GE Zenith Controls.
c. Caterpillar.
d. Onan/Cummins Power Generation.
e. Russelectric, Inc.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

I. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

J. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

K. Battery Charger: For generator starting batteries.

1. Float type rated 2 A.
2. Ammeter to display charging current.
3. Fused ac inputs and dc outputs.

L. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

M. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

N. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

G. Automatic Closed-Transition Transfer Switches: Include the following functions and characteristics:

1. Fully automatic make-before-break operation.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator.
    b. Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

4. Failure of power source serving load initiates automatic break-before-make transfer.

H. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

I. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

J. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Pause is adjustable from 0.5 to 30 seconds minimum and factory set for 0.5 second, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

K. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Switch position.
3. Switch in test mode.
4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.5 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Section 260529 "Hangers and Supports for Electrical Systems."

B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

C. Identify components according to Section 260553 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Section 017900 "Demonstration and Training."

B. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 264113 - LIGHTNING PROTECTION FOR STRUCTURES

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 lightning protection for structures.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For air terminals and mounting accessories.

1. Layout of the lightning protection system, along with details of the components to be used in the installation.
2. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer. Include data on listing or certification by UL.

B. Certification, signed by Contractor, that roof adhesive is approved by manufacturer of roofing material.

C. Field quality-control reports.

D. Comply with recommendations in NFPA 780, Annex D, "Inspection and Maintenance of Lightning Protection Systems," for maintenance of the lightning protection system.

E. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:

1. Ground rods.
2. Ground loop conductor.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Certified by UL, trained and approved for installation of units required for this Project.

B. System Certificate:

1. UL Master Label.
2. UL Master Label Recertification.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

1.6 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer.

C. Flashings of through-roof assemblies shall comply with roofing manufacturers' specifications.

PART 2 - PRODUCTS

2.1 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96 and NFPA 780.

B. Roof-Mounted Air Terminals: NFPA 780, Class I, copper unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Advanced Lightning Technology, LTD.
b. East Coast Lightning Equipment Inc.
c. ERICO International Corporation.

2. Air Terminals More than 24 Inches Long: With brace attached to the terminal at not less than half the height of the terminal.
3. Single-Membrane, Roof-Mounted Air Terminals: Designed specifically for single-membrane roof system materials. Comply with requirements in roofing Sections.

C. Main and Bonding Conductors: Copper.

D. Ground Loop Conductor: The same size and type as the main conductor except tinned.

E. Ground Rods: Copper-clad steel; 3/4 inch in diameter by 10 feet long.

F. Heavy-Duty, Stack-Mounted, Lightning Protection Components: Stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and NFPA 780.

B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends.

C. Conceal the following conductors:

1. System conductors.
2. Down conductors.
3. Interior conductors.
4. Conductors within normal view of exterior locations at grade within 200 feet of building.

D. Cable Connections: Use crimped or bolted connections for all conductor splices and connections between conductors and other components. Use exothermic-welded connections in underground portions of the system.

E. Cable Connections: Use exothermic-welded connections for all conductor splices and connections between conductors and other components.

1. Exception: In single-ply membrane roofing, exothermic-welded connections may be used only below the roof level.

F. Air Terminals on Single-Ply Membrane Roofing: Comply with roofing membrane and adhesive manufacturer's written instructions.

G. Bond extremities of vertical metal bodies exceeding 60 feet in length to lightning protection components.

H. Ground Loop: Install ground-level, potential equalization conductor and extend around the perimeter of structure.

1. Bury ground ring not less than 24 inches from building foundation.
2. Bond ground terminals to the ground loop.
3. Bond grounded building systems to the ground loop conductor within 12 feet of grade level.

I. Bond lightning protection components with intermediate-level interconnection loop conductors to grounded metal bodies of building at 60-foot intervals.

3.2 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

A. Notify Architect at least 48 hours in advance of inspection before concealing lightning protection components.

B. UL Inspection: Meet requirements to obtain a UL Master Label for system.

END OF SECTION 264113

SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

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 field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Requirements:
   1. Section 262416 "Panelboards" for factory-installed SPDs.

1.3 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCESUPPRESSOR

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Advanced Protection Technologies Inc. (APT).
2. Current Technology Inc.
3. LEA International.
4. Liebert; a brand of Emerson Electric Co.

B. SPDs: Comply with UL 1449, Type 1.

C. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1

1. SPDs with the following features and accessories:

a. Integral disconnect switch.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
c. Indicator light display for protection status.
d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
e. Surge counter.

D. Comply with UL 1283.

E. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

F. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 208Y/120 V.
3. Line to Line: 1000 V for 208Y/120 V.

G. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Line to Line: 1000 V.

H. SCCR: Equal or exceed 100 kA.

I. Inominal Rating: 20 kA.

2.3 PANEL SUPPRESSORS

A. Retain this article for SPDs other than those installed at the service entrance. SPD described in this article is required by NFPA 70 to be installed with OCPD. The type and size of OCPD depends on the UL listing requirements. See "SPD Types" Article in the Evaluations.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Advanced Protection Technologies Inc. (APT).
2. Current Technology Inc.
3. Leviton Manufacturing Co., Inc.

4. Liebert; a brand of Emerson Electric Co.

C. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Comply with UL 1283.

F. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 208Y/120 V.
3. Neutral to Ground: 1200 V for 208Y/120 V.
4. Line to Line: 1000 V for 208Y/120 V

G. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Neutral to Ground: 700 V.
4. Line to Line: 1200 V.

H. SCCR: Equal or exceed 100 kA.

I. Inominal Rating: 20 kA.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Class 2 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 , complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 SUBSTITUTION LIGHT FIXTURES

A. The light fixture layout in spaces indicated in the Contract Documents are the basis of design and are based upon photometric data, quality, construction and appearance of fixtures listed in the lighting fixture schedule. Substitute light fixtures of those listed are allowed. Provide the following:
1. Provide all data as required for submittal package. Indicate variances with fixtures listed in lighting fixture schedule.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.

3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of luminaire.

C. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Sample warranty.

E. Product Certificates: For each type of luminaire.

F. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

G. Sample warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

1.11 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Single Face Exit Signs: Furnish five single face exit signs. Include 100'-0" feet of wire and conduit, installed for each exit sign. Provide connection to the emergency circuit as directed by the owner.

2. Double Face Exit Signs: Furnish five double face exit signs. Include 100'-0" feet of wire and conduit, installed for each exit sign. Provide connection to the emergency circuit as directed by the owner.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. Recessed Fixtures: Comply with NEMA LE 4.

D. Bulb shape complying with ANSI C79.1.

E. Lamp base complying with ANSI C81.61.

F. CRI of minimum 80. CCT of 3500 K.

G. Rated lamp life of 50,000 hours.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver:
1. Minimum efficiency: 85% at full load.
2. Minimum Operating Ambient Temperature: -20˚ C. (-4˚ F.).
3. Input Voltage: 120 - 277V (±10%) at 60 Hz.
4. Integral short circuit, open circuit, and overload protection.
5. Power Factor: ≥ 0.95.
6. Total Harmonic Distortion: ≤ 20%.
7. Comply with FCC 47 CFR Part 15.

J. LED Modules:
1. Comply with IES LM-79 and LM-80 requirements.
2. Minimum CRI 80 and color temperature 4200˚ K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
3. Minimum Rated Life: 50,000 hours per IES L70.
4. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.

K. Nominal Operating Voltage: 120/277 V ac.

L. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

M. Housings:

1. Stamped steel or extruded-aluminum housing and heat sink.
2. Powder-coat finish.

2.2 CYLINDER

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

B. Minimum 1000 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. With integral mounting provisions.

2.3 DOWNLIGHT

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

B. Minimum 1,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Universal mounting bracket.

D. Integral junction box with conduit fittings.

2.4 LINEAR INDUSTRIAL

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

B. Minimum 5,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

2.5 HIGHBAY, LINEAR

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

Minimum 10,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

2.6 RECESSED LINEAR

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

B. Minimum 3,000 lumens. Minimum allowable efficacy of 85 lumens per watt.

C. Integral junction box with conduit fittings.

2.7 STRIP LIGHT

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

B. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.8 SURFACE MOUNT, LINEAR

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

B. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.9 SURFACE MOUNT, NONLINEAR

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

B. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.10 SUSPENDED, LINEAR

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

B. Minimum 3,000 lumens. Minimum allowable efficacy of 85 lumens per watt.

2.11 SUSPENDED, NONLINEAR

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.

B. Minimum 3,000 lumens. Minimum allowable efficacy of 85 lumens per watt.

C. Integral junction box with conduit fittings.

2.12 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Prismatic acrylic

2. Retain "Acrylic Diffusers" Subparagraph below if fifth or sixth option in "Diffusers and Globes" Paragraph above is retained.
3. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
4. Glass: Annealed crystal glass unless otherwise indicated.
5. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Stamped steel or extruded-aluminum housing and heat sink.
2. Powder-coat finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.13 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.14 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.
2. Ceiling mount with four-point pendant mount with 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.

4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 265619 – LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.

2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

    a. Manufacturer's Certified Data: Photometric data certified by manufacturer?s laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.

6. Wiring diagrams for power, control, and signal wiring.
7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing laboratory providing photometric data for luminaires.

B. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

C. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Source quality-control reports.

E. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.

2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 QUALITY ASSURANCE

A. Provide luminaires from a single manufacturer for each luminaire type.

B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

C. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.9 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location, where indicated.

E. Lamp base complying with ANSI C81.61.

F. Bulb shape complying with ANSI C79.1.

G. CRI of minimum 70. CCT of 3000 K.

H. L70 lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: 208 V ac.

L. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

M. Source Limitations: Obtain luminaires from single source from a single manufacturer.

2.2 LUMINAIRE TYPES

A. Area and Site:

1. Manufacturers: Subject to compliance with requirements, provide products as scheduled on the drawings.
2. Luminaire Shape: Square.
3. Mounting: Pole with extruded-aluminum rectangular arm, 11 inches in length.
4. Luminaire-Mounting Height: As indicated on light fixture schedule.
5. Distribution: As indicated by part number in light fixture schedule.
6. Housings:
    a. Extruded-aluminum housing and heat sink.
    b. Clear anodized powder-coat finish.

2.3 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:
   1. Glass: Annealed crystal glass unless otherwise indicated.
   2. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

   1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
   2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

   1. Label shall include the following lamp characteristics:

      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter, shape, size, wattage and coating.
      c. CCT and CRI for all luminaires.

2.4 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

   1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   2. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I,

integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

a. Color: Black.

2.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.

4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached using through bolts and backing plates on either side of wall.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

a. IES LM-5.
b. IES LM-50.
c. IES LM-52.
d. IES LM-64.
e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265619

SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Communications equipment coordination and installation.
2. Sleeves for pathways and cables.
3. Sleeve seals.
4. Grout.
5. Common communications installation requirements.

1.2 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For sleeve seals.

1.4 COORDINATION

A. Coordinate arrangement, mounting, and support of communications equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

PART 2 - PRODUCTS

2.1 SLEEVES FOR PATHWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pathway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 270500

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Boxes, enclosures, and cabinets.
4. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Section 260533 "Raceways and Boxes for Electrical Systems" for conduits, wireways, surface raceways, boxes, enclosures, cabinets, handholes, and faceplate adapters serving electrical systems.
3. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For pathway racks, enclosures, cabinets, equipment racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. AFC Cable Systems; a part of Atkore International.
2. Allied Tube & Conduit; a part of Atkore International.
3. Alpha Wire.
4. Southwire Company.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel or die cast.
b. Type: compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. AFC Cable Systems; a part of Atkore International.
2. Allied Tube & Conduit; a part of Atkore International.
3. Electri-Flex Company.
4. RACO; Hubbell.
5. Thomas & Betts Corporation; A Member of the ABB Group.

B. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Rigid HDPE: Comply with UL 651A.

E. Continuous HDPE: Comply with UL 651B.

F. RTRC: Comply with UL 1684A and NEMA TC 14.

G. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

I. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Carlon; a brand of Thomas & Betts Corporation.
2. Quazite: Hubbell Power Systems, Inc.
3. RACO; Hubbell.
4. Thomas & Betts Corporation; A Member of the ABB Group.
5. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-B.
2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

F. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

K. Gangable boxes are prohibited.

L. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures:

   a. Material: Plastic.
   b. Finished inside with radio-frequency-resistant paint.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

N. Cabinets:

1. NEMA 250, Type 1 Type 3R, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND CABLING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Comply with TIA-569-B.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Armorcast Products Company.
b. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "COMMUNICATIONS.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete or fiberglass.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armorcast Products Company.
b. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Color of Frame and Cover: Confirm with the architect & owner.
4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "COMMUNICATIONS.".
8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC IMC.
2. Concealed Conduit, Aboveground: GRC IMC EMT.
3. Underground Conduit: RNC, Type EPC-40-PVC Type EPC-80-PVC, direct buried concrete encased.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT or RNC.
2. Exposed, Not Subject to Severe Physical Damage: EMT RNC identified for such use.
3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:

    a. Mechanical rooms.
    b. Gymnasiums

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: GRC IMC.
6. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 stainless steel or nonmetallic in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch trade size. Minimum size for optical-fiber cables is 1 inch.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
3. Arrange pathways to keep a minimum of 1 inch of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to GRC or IMC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

N. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lbtensile strength. Leave at least 12 inchesof slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

R. Pathways forCommunications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

S. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

T. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

BB. Set metal floor boxes level and flush with finished floor surface.

CC. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits, but a minimum of 6 inches below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, 36" below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528

SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Telecommunications mounting elements.
2. Backboards.
3. Telecommunications equipment racks and cabinets.
4. Telecommunications service entrance pathways.
5. Grounding.

B. Related Sections:

1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for conduits that serve communication cabling.
2. Division 26 Section "Raceways and Boxes for Electrical Systems" for conduits that serve communication cabling.
3. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
4. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.
5. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

B. BICSI: Building Industry Consulting Service International.

C. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel not exceeding 6 inches in width.

D. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

E. LAN: Local area network.

F. RCDD: Registered Communications Distribution Designer.

G. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of a bottom without ventilation openings within integral or separate longitudinal side rails.

H. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Floor-mounted cabinets and cable pathways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

D. Seismic Qualification Certificates: For floor-mounted cabinets, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A. Requirements of this standard include but are not limited to minimum 1/8" per foot slope for drainage of underground communication ductbank conduits; coordinate with Division 26 conduit installation.

D. Grounding: Comply with ANSI-J-STD-607-A.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.8 COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

B. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.

1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
2. Support brackets with cable tie slots for fastening cable ties to brackets.
3. Lacing bars, spools, J-hooks, and D-rings.
4. Straps and other devices.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels specified in Division 06 Section "Rough Carpentry."

2.3 EQUIPMENT FRAMES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC.
2. Aim Electronics; a brand of Emerson Electric Co.
3. AMP; a Tyco International Ltd. company.
4. Cooper B-Line, Inc.
5. Hubbell Premise Wiring.
6. KRONE Incorporated.
7. Leviton Voice & Data Division.
8. Middle Atlantic Products, Inc.
9. Nordex/CDT; a subsidiary of Cable Design Technologies.
10. Ortronics, Inc.
11. Panduit Corp.
12. Siemon Co. (The).

B. General Frame Requirements:

1. Distribution Frames: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Module Dimension: Width compatible with EIA 310 standard, 19-inch panel mounting.
3. Finish: Manufacturer's standard, baked-polyester powder coat.

C. Floor-Mounted Racks: Modular-type, aluminum construction.

1. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, and a power strip.
2. Baked-polyester powder coat finish.

D. Modular Wall Cabinets:

1. Wall mounting.
2. Aluminum construction.
3. Treated to resist corrosion.
4. Lockable front and rear doors.
5. Louvered side panels.
6. Cable access provisions top and bottom.
7. Grounding lug.
8. Rack-mounted, 250-cfm (118-L/s) fan.
9. Power strip.
10. All cabinets keyed alike.

E. Cable Management for Equipment Frames:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

2.4 POWER STRIPS

A. Power Strips: Comply with UL 1363.

1. Rack mounting.
2. Six, 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles.
3. LED indicator lights for power and protection status.
4. LED indicator lights for reverse polarity and open outlet ground.
5. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
6. Cord connected with 15-foot line cord.
7. Rocker-type on-off switch, illuminated when in on position.
8. Peak Single-Impulse Surge Current Rating: 13 kA per phase.
9. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.

2.5 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.

B. Telecommunications Main Grounding Busbar (TMGB):

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide x 20 inches with (27) pairs of 5/16-inch and (3) pairs of 7/16-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

C. Telecommunications Grounding Busbar (TGB):

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 2 inches wide x 13 inches with (6) pairs of 5/16-inch and (3) pairs of 7/16-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

D. Comply with ANSI-J-STD-607-A.

2.6 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

B. Install underground pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.

3.2 Install underground entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems."INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."Comply with TIA/EIA-569-A, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.4 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

1. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.5 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements.

C. Labels shall be preprinted or computer-printed type.

END OF SECTION 271100

SECTION 275515 – BI-DIRECTIONAL AMPLIFICATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Provide an in-building radio signal amplification system to provide complete coverage in the building for the public safety agencies as required by the local AHJ (Authority Having Jurisdiction). System users shall receive and transmit radio signals from their portable radio units within the building. This shall be accomplished utilizing the following components:

1. Bi Directional Amplifiers (Signal Boosters)
2. Coaxial Cable
3. Antennas
4. Cable taps
5. Connectors
6. Power dividers
7. Other components and interconnecting circuitry as required

B. The system shall comply with the requirements of UL2524 In-building 2-Way Emergency Radio Communication Enhancement Systems, NFPA 72 2013 Edition, NFPA 1221 2016 Edition and IFC 2015, as referenced.

C. The entire system shall meet the requirements of the Fire Department, the Building Department and all other agencies and authorities having jurisdiction (AHJ).

D. The work in this section shall include the responsibility for all permit requirements with the AHJ. Where filings require engineer's signature, documents shall be submitted for his review and signature. This responsibility shall include furnishing of required quantities of floor plans, descriptive notes and/or specifications, wiring diagrams, shop drawings and amendment forms.

E. Early completion of the in-building emergency radio communication enhancement system will be required as to permit a Certificate of Occupancy to be obtained in a timely manner

F. Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included

G. The in-building emergency radio communication enhancement system shall use a UL2524, NFPA 72, NFPA 1221 and IFC 2018 compliant GAMEWELL-FCI signal booster or approved equal.

H. Product Data: For each type of product indicated.

I. Shop Drawings: For the Bi-Directional Amplification system, Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include scaled drawings for station arrangement of built-in equipment.
3. Wiring Diagrams: For power, signal, and control wiring.

a. Identify terminals to facilitate installation, operation, and maintenance.
b. Single-line diagram showing interconnection of components.
c. Cabling diagram showing cable routing.

J. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings are shown and coordinated with each other, using input from installers of the items involved.

K. Qualification Data: For qualified Installer.

L. Field quality-control reports.

M. Operation and Maintenance Data: For the Bi-Directional Amplification system to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. A record of Owner's equipment-programming option decisions.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain Bi-Directional Amplification system from single source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for location and application.

D. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate layout and installation of ceiling-mounted antennas and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.1 RADIO COMMUNICATION ENHANCEMENT SYSTEM (BDA SYSTEM)

A. DESIGN REQUIREMENTS

1. In-building emergency radio communication enhancement systems for emergency responders are an integral component of the life safety equipment of a building or structure. The primary function is to provide reliable emergency responder communications at the required signal strength within the specified areas.

2. Critical Areas such as emergency command center, fire pump room, exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations and similar critical areas shall be provided with 100% floor area radio coverage.

3. General building areas shall be provided with 95% radio coverage, or as specified by AHJ.

4. The In-building emergency radio communication enhancement systems must provide the following signal strengths:
   a. Downlink - Minimum signal strength of -95 dBm throughout the coverage area.
   b. Uplink - Minimum signal strength of -95 dBm received at the AHJ Radio System.
   c. OR As otherwise required by the AHJ

5. The system shall be complete with all components and wiring required for compliance with all applicable codes and regulations, and for its operations described hereinafter.

6. An approved manufacturer or a qualified and approved vendor shall supply, test and determine locations of components which are required for proper operation as well as to supply, install, test and certify the performance of the complete system. Vendor qualifications must be acceptable to the AHJ.

7. Design shall include iBwave software-simulated radio propagation modeling with heat maps showing predicted signal coverage levels within the building. The iBWave design shall be done by iBWave certified personnel.

8. All tests shall be conducted, documented, and signed by a person in possession of an FCC General Radio Telephone Operators License. All testing personnel shall be certified and authorized by the signal booster manufacturer in the installation and operation of their equipment. Personnel qualifications must be acceptable to the AHJ.

9. The system design shall be based on the GAMEWELL-FCI line of Public Safety Signal Boosters UL2524, NFPA 72, NFPA 1221, IFC and FCC certified to establish standards of quality for materials and performance. The naming of a specific manufacturer or a catalog number does not waiver any requirement or performance of individual components described in the specifications.

10. Assembly and installation of all components of the Emergency Responder Radio Communication Enhancement System shall comply with all applicable sections of the National Electrical Code.

11. Survivability from attack by fire shall meet requirements of NFPA 72, NFPA 1221, IFC or as required by the local jurisdiction.

12. The system must comply with all applicable sections of the FCC rules. Signal booster shall have FCC certification prior to installation.

1. Antenna isolation shall be maintained between the donor antenna and all inside antennas (D.A.S.) to a minimum of 20dB under all operating conditions

B. TECHNICAL SPECIFICATIONS AND PERFORMANCE REQUIREMENTS

1. The system specified shall be based upon GAMEWELL-FCI line of Public Safety UL2524, NFPA72, NFPA 1221, IFC compliant signal boosters

2. The signal booster shall be a Class B Public Safety type as designated by the FCC or as required by the AHJ.

3. The secondary power supplies, battery chargers and system monitoring shall be fully compliant with NFPA 72, NFPA 1221 and IFC. The signal booster shall have both the primary and the secondary power supplies within a waterproof, type-4 approved enclosure.

4. All signal boosters and other active system components must have FCC certification prior to installation. The equipment FCC ID must be shown on the product datasheets and technical submittals. The ID must also be displayed on the product as required by the FCC.

5. The signal booster shall be pre-set by the equipment manufacturer for the frequencies specified by the AHJ. Field tuning of RF filters and duplexers is not allowed.

6. UHF and VHF signal boosters shall be band selective type with a maximum 3dB channel bandwidth of 200KHz (Fc +/- 100KHz) per band. Non-selective wide-band signal boosters shall not be accepted, unless required to cover multiple channels within the same band.

7. Signal Boosters shall have oscillation suppression circuitry to protect the public safety radio system in case of system malfunction or other causes. The oscillation suppression circuit shall not disable the system operation. Systems that automatically disable the signal booster upon oscillation detection shall not be allowed.

8. Signal Boosters shall have uplink noise suppression function to eliminate uplink noise while in standby (i.e. no radio transmission from within a building). Systems that produce any measurable level of uplink noise while in standby shall not be allowed.

9. Signal Booster gain shall be rated at minimum of 80dB and the gain shall be adjustable in a minimum of 30dB range. System gain shall be set and documented at the time of the final system test.

10. Maximum Propagation delay of the signal booster system shall be 14µs (microseconds) or as specified by AHJ.

11. The signal booster system shall include built-in automatic supervision of malfunctions of the signal booster and battery system as per NFPA 1221 NFPA 72 and IFC. Non-OEM equipment add-ons and modifications to comply with this specification shall not be allowed.

12. A dedicated supervised monitoring panel shall be provided within the emergency command center next to the fire alarm panel / annunciator or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:

    a. Normal AC power
    b. Signal booster trouble
    c. Antenna Failure
    d. Loss of normal AC power
    e. Failure of battery charger
    f. Low battery capacity

12. If signal booster is supervised by a GAMEWELL-FCI fire alarm panel, the signal booster system shall include a compatible, OEM built-in GAMEWELL-FCI addressable monitoring module If signal booster is supervised by other brand FACP, the signal booster shall be Honeywell branded model with universal normally open relays for connection to external monitoring modules.

13. External filters, duplexers, power supplies or other non-OEM additions or modifications of the original equipment shall not be allowed. All duplexers shall be built-in and FCC certified with the signal booster as an complete and fully integrated FCC-certified and UL-Listed unit.

14. All signal booster components shall be contained in a type-4 approved waterproof enclosure. All enclosures shall be painted red with external labeling as required by the AHJ.

C. INSTALLATION REQUIREMENTS

1. Installation of all components of the Emergency Responder Communication Enhancement System shall comply with all applicable sections of the National Electrical Code NFPA-70, NFPA-72, NFPA 1221, IFC or as required by the local AHJ.

2. At least 2 independent and reliable power supplies shall be provided as specified in NFPA 72, NFPA 1221 and IFC.

3. The primary power source shall be supplied from a dedicated twenty (20) ampere branch circuit and comply with NFPA-70 National Electrical Code, NFPA 72 and NFPA 1221 2016 edition.

   The signal booster shall be equipped with a secondary source of power. The secondary source of power shall be a battery system with a dedicated battery charger powered by a separate, dedicated twenty (20) ampere branch circuit. The secondary power supply shall power on automatically when the primary power source is lost. The secondary source of power shall be capable of operating the emergency responder radio coverage enhancement system for a period of at least 24 hours. The battery system shall

automatically charge in the presence of external power input. Battery charger and all other electronic components must be fully enclosed in a waterproof Type-4 approved enclosure. Batteries shall be enclosed in a separate, vented Type-3R approved enclosure. External UPS (Uninterruptable Power Supplies) are not acceptable..

4. RF Coaxial Cable shall be a listed, CMP plenum. Non-plenum cable can be used when installed in a metallic raceway. The cable classification shall be clearly marked on the outer surface of the cable regular intervals.

D. ACCEPTANCE AND TEST PROCEDURES

1. Acceptance testing for an in-building radio system is required upon completion of installation.

2. The coverage testing shall be done in accordance with NFPA 72, NFPA 1221, IFC and as required by the local AHJ

3. All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radio Operator License.

4. All test records along with system diagrams, iBWave design, equipment specifications, user manuals, RF link budget calculations, battery backup calculation and other design data shall be submitted upon completion of the project, and as required by the AHJ.

END OF SECTION 275515

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electronic safety and security equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electronic safety and security installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4 SECURITY FASTENERS:

A. Description: Accessories, anchorage inserts, and security fasteners providing a complete tamperproof installation.

B. Exposed Security Fasteners:
1. Fastener: Provide **torx-head** (star with center reject pin) security fasteners for anchoring work in exposed security areas.
2. Finish: Finish shall match that specified of the item anchored.
3. Tools: Provide tools for fastening devices.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

A. Comply with NECA 1-2006. Mounting heights indicated on contract documents supersede NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.5 SECURITY FASTENERS

A. All fasteners exposed in security areas shall be security fasteners. Where standard fasteners on manufactured devices and equipment are accessible, they shall be replaced with security fasteners.

END OF SECTION 280500

SECTION 280528 - PATHWAYS FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Metal conduits, tubing, and fittings.
2. Nonmetallic conduits, tubing, and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Surface pathways.
5. Boxes, enclosures, and cabinets.
6. Handholes and boxes for exterior underground cabling.

1.3 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. General Requirements for Metal Conduits and Fittings:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. ARC: Comply with ANSI C80.5 and UL 6A.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; zinc-coated steel or aluminum.

F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:
a. Material: Steel or die cast.
b. Type: Setscrew or compression.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.

G. Joint Compound for GRC or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. General Requirements for Nonmetallic Conduits and Fittings:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Comply with TIA-569-B.

B. ENT: Comply with NEMA TC 13 and UL 1653.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Continuous HDPE: Comply with UL 651B.

E. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Description: Comply with UL 2024; flexible-type pathway, approved for plenum riser or general-use installation unless otherwise indicated.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Comply with TIA-569-B.

2.4 SURFACE PATHWAYS

A. General Requirements for Surface Pathways:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Comply with TIA-569-B.

B. Surface Metal Pathways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish.

C. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets:
   1. Comply with TIA-569-B.
   2. All enclosures, cabinets, housings, boxes, and fittings having hinged doors or removable covers must be able to be locked or secured with tamper resistant security fasteners.
   3. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

H. Gangable boxes are prohibited.

I. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Nonmetallic Enclosures: Plastic or fiberglass.
   3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:
   1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
   6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND CABLING

A. General Requirements for Handholes and Boxes:
   1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
   2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   3. Comply with TIA-569-B.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
   1. Standard: Comply with SCTE 77.
   2. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
   3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
   4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   5. Cover Legend: Molded lettering, "ELECTRIC" or "COMMUNICATIONS."

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of polymer concrete.
   1. Standard: Comply with SCTE 77.
   2. Color of Frame and Cover: Gray.
   3. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
   4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
   5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

6. Cover Legend: Molded lettering, "ELECTRIC" or "COMMUNICATIONS."

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: GRC.
   3. Underground Conduit: RNC, Type EPC-80-PVC, concrete encased.
   4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: GRC.
   4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric-Solenoid, or Motor-Driven Equipment): FMC
   6. Damp or Wet Locations: GRC.
   7. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway Plenum-type, communications-cable pathway EMT.
   8. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway Riser-type, communications-cable pathway EMT.
   9. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway Riser-type, optical-fiber-cable pathway Plenum-type, optical-fiber-cable pathway General-use, communications-cable pathway Riser-type, communications-cable pathway Plenum-type, communications-cable pathway EMT.
   10. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

C. Minimum Pathway Size: 3/4-inch trade size. Minimum size for optical-fiber cables is 1 inch.

D. Pathway Fittings: Compatible with pathways and suitable for use and location.
   1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
   3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum

pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.

D. Comply with requirements in Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for underground duct installation.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications wiring conduits for which only two 90-degree bends are allowed. Support within 12 inches of changes in direction.

F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Pathways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
   2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange pathways to keep a minimum of 2 inches of concrete cover in all directions.
   4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

H. Stub-ups to Above Recessed Ceilings:
   1. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

I. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

K. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to conduit assembly to assure a continuous ground path.

M. Spare Pathways: Install pull wires in empty pathways. Cap underground pathways designated as spare above grade alongside pathways in use.

N. Surface Pathways:
   1. Install surface pathway for surface electrical outlet boxes only where indicated on Drawings.

O. Pathways for Optical-Fiber and Communications Cable: Install pathways as follows:
   1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
   2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
   3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements.

P. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound.

Q. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

R. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
   d. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

T. Mount boxes at heights indicated on Drawings according to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

U. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earthwork" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earthwork."
3. After installing conduit, backfill and compact. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earthwork."

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Division 26 Section "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

C. Install handholes with bottom below frost line, below grade.

D. Field cut openings for conduits according to enclosure manufacturer's written instructions.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRONIC SECURITY PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 28 Section "Common Work Results for Electronic Safety and Security."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

END OF SECTION 280528

SECTION 281525
ELECTRONIC KEY MANAGEMENT SYSTEM

PART 1 GENERAL

1.01 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate with Division 26 electrical installer for location of 120V outlet.

B. Coordination: Coordinate with Division 6 "Rough Carpentry" or Division 9 "Cold Formed Steel Framing - Non-Structural" to provide in wall blocking or reinforcment for attachment of surface mounted units.

1.02 SUBMITTALS

A. Product Data: Manufacturer's published data on key management system construction, sizes, and accessories.

B. Shop Drawings: Indicate plan and elevation layout indicating dimensions and installation heights.

C. Samples: Submit manufacturer's color charts illustrating full range of available colors.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect unit finishes and adjacent surfaces from damage.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide 2 year manufacturer warranty for materials and workmanship. Complete forms in Owner's name and register with manufacturer.

1. Warranty shall cover failures including material and finish failure and faulty operation of latches, hinges, or other hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Key Management System:

1. Basis-of-Design: KeyCafe; MS5 Base SmartBox 9 Bin, and MS5E-18 Expansion SmartBox 18 Bin (total of 27 bins).
2. Substitutions: In accordance with Division 1 Section "Product Requirements." Substitute products shall require demonstration to Owner for final approval.

2.02 KEY MANAGEMENT SYSTEM

A. Key Management System: Factory-assembled, manufacturer's standard fabrication of steel or steel-reinforced polycarbonate, surface mounted.

1. Total Assembly Dimensions (per basis-of-design): 11.4" W by 23.3" H by 4" D, nominal (basis of design shall have base unit and expansion mounted side-by-side for 22.8" width, nominal).
2. Configuration: Minimum of 27 individual locking compartments.
3. Dimensions and configuration may slightly vary for manufacturers other than basis-of-design. Provide custom unit or multiple standard units to achieve minimum number of compartments indicated as required. Contractor shall verify space requirements for

submitted product and coordinate with wall/partition installer to ensure in-wall blocking is properly sized for product.

a. Key management system shall be surface mounted; and shall not exceed 4 inch depth.

b. Operable display screen and a minimum of 5% of storage units shall be at accessible height (with all operating components mounted under 48" above finish floor). Verify final mounting height in field with Architect and Owner.

4. Construction: Manufacturer's standard construction; basis-of-design is steel-reinforced polycarbonate. Provide with manufacturer's standard hinges, latch, and locking components for a secure installation.

5. Electrical Requirements: 120V outlet for plug and play operation. Coordinate with electrical installer and with Architect for installation location of outlet.

6. Finish and Color: Manufacturer's standard finish; color to be selected from manufacturer's standard range by Architect when applicable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify embedded framing, anchors, and blocking are properly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and anchor securely at prepared wall location.

C. Install key management system plumb and square.

D. Secure key management system with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

E. Install fittings if not factory installed.

F. Replace components that do not operate smoothly.

3.03 DEMONSTRATION AND TRAINING

A. Demonstration and Training: Manufacturer's authorized representative shall provide a minimum of two hours training in use of key management system, including touch screen interface, use of app or PIN codes, and administrative auditing and remote management system.

3.04 CLEANING

A. Clean interior and exterior surfaces of key management system immediately prior to Substantial Completion.

END OF SECTION 281525

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Air-sampling smoke detectors.
5. Nonsystem smoke detectors.
6. Heat detectors.
7. Notification appliances.
8. Device guards.
9. Firefighters' two-way telephone communication service.
10. Magnetic door holders.
11. Remote annunciator.
12. Addressable interface device.
13. Digital alarm communicator transmitter.
14. Radio alarm transmitter.
15. Network communications.
16. System printer.

B. Related Requirements:

1. Section 280513 "Conductors and Cables for Electronic Safety and Security" for cables and conductors for fire-alarm systems.

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. HLI: High Level Interface.

D. NICET: National Institute for Certification in Engineering Technologies.

E. PC: Personal computer.

F. VESDA: Very Early Smoke-Detection Apparatus.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.
12. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' control system.
    c. Locate detectors according to manufacturer's written recommendations.
    d. Show air-sampling detector pipe routing.

13. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:

1. Submittals shall be approved by the architect prior to submission to authorities having jurisdiction.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified, fire-alarm technician; Level III minimum.
c. Licensed or certified by authorities having jurisdiction.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

1.6 Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:

a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
d. Riser diagram.
e. Device addresses.
f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
g. Record copy of site-specific software.
h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

i. Manufacturer's required maintenance related to system warranty requirements.
j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
3. Smoke Detectors, Fire Detectors: Quantity equal to 5 percent of amount of each type installed, but no fewer than one unit of each type.
4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
5. Keys and Tools: One extra set for access to locked or tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.

C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

D. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

E. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FM Global-approved alarm company.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and voice/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Flame detectors.
4. Smoke detectors.
5. Duct smoke detectors.
6. Carbon monoxide detectors.
7. Combustible gas detectors.
8. Automatic sprinkler system water flow.
9. Preaction system.
10. Fire-extinguishing system operation.
11. Fire standpipe system.
12. Dry system pressure flow switch.
13. Fire pump running.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances, including voice evacuation notices.
2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Activate voice/alarm communication system.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.

9. Activate stairwell and elevator-shaft pressurization systems.
10. Close smoke dampers in air ducts of designated air-conditioning duct systems.
11. Activate preaction system.
12. Recall elevators to primary or alternate recall floors.
13. Activate elevator power shunt trip.
14. Activate emergency lighting control.
15. Activate emergency shutoffs for gas and fuel supplies.
16. Record events in the system memory.
17. Record events by the system printer.
18. Indicate device in alarm on the graphic annunciator.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
3. Alert and Action signals of air-sampling detector system.
4. Elevator shunt-trip supervision.
5. Fire pump running.
6. Fire-pump loss of power.
7. Fire-pump power phase reversal.
8. Independent fire-detection and -suppression systems.
9. User disabling of zones or individual devices.
10. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Voice signal amplifier failure.
11. Hose cabinet door open.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.
6. Display system status on graphic annunciator.

2.3 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Gamewell - FCI by Honeywell.
2. Notifier.
3. SimplexGrinnell LP.

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.

a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.
c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
d. The FACP shall be listed for connection to a central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.

2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, three line(s) of 80 Insert number characters, minimum.

2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

E. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class A.
2. Pathway Survivability: Level 0.
3. Install no more than 50 addressable devices on each signaling-line circuit.
4. Serial Interfaces:

    a. One dedicated RS 485 port for remote station operation using point ID DACT.
    b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
    c. One USB port for PC configuration.
    d. One RS 232 port for VESDA HLI connection.
    e. One RS 232 port for voice evacuation interface.

F. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

G. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

H. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to fire-alarm system.

I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

J. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

K.

L. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of alarm, supervisory, and trouble conditions in the system and a historical log of events.

M. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

N. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

O. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Gamewell - FCI by Honeywell.
2. Notifier.
3. SimplexGrinnell LP.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
3. Station Reset: Key- or wrench-operated switch.
4. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

5. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.5 SYSTEM SMOKE DETECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Gamewell - FCI by Honeywell.
2. Notifier.
3. SimplexGrinnell LP.

B. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition.

    a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
    b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
    c. Multiple levels of detection sensitivity for each sensor.
    d. Sensitivity levels based on time of day.

C. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

D. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

E. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.6 CARBON MONOXIDE DETECTORS

A. General: Carbon monoxide detector listed for connection to fire-alarm system.

1. Mounting: Adapter plate for outlet box mounting.
2. Testable by introducing test carbon monoxide into the sensing cell.
3. Detector shall provide alarm contacts and trouble contacts.
4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Comply with UL 2075.
6. Locate, mount, and wire according to manufacturer's written instructions.
7. Provide means for addressable connection to fire-alarm system.
8. Test button simulates an alarm condition.

2.7 MULTICRITERIA DETECTORS

A. Mounting: Twist-lock base interchangeable with smoke-detector bases.

B. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms.

D. Test button tests all sensors in the detector.

E. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

1. Primary status.
2. Device type.
3. Present sensitivity selected.
4. Sensor range (normal, dirty, etc.).

F. Sensors: The detector shall be comprised of four sensing elements including a smoke sensor, a carbon monoxide sensor, an infrared sensor, and a heat sensor.

1. Smoke sensor shall be photoelectric type as described in "System Smoke Detectors" Article.
2. Carbon monoxide sensor shall be as described in "Carbon Monoxide Detectors" Article.
3. Heat sensor shall be as described in "Heat Detectors" Article.
4. Each sensor shall be separately listed according to requirements for its detector type.

2.8 HEAT DETECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Gamewell - FCI by Honeywell.
2. Notifier.
3. SimplexGrinnell LP.

B. General Requirements for Heat Detectors: Comply with UL 521.

1. Temperature sensors shall test for and communicate the sensitivity range of the device.

C. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

E. Continuous Linear Heat-Detector System:

1. Detector Cable: Rated detection temperature 155 deg F. Listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short circuit wires at the location of elevated temperature.
2. Control Unit: Two-zone or multizone unit as indicated. Provide same system power supply, supervision, and alarm features as specified for fire-alarm control unit.
3. Signals to Fire-Alarm Control Unit: Any type of local system trouble shall be reported to fire-alarm control unit as a composite "trouble" signal. Alarms on each detection zone shall be individually reported to central fire-alarm control unit as separately identified zones.
4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.9 NOTIFICATION APPLIANCES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Federal Signal Corporation.
2. Siemens Industry, Inc.; Fire Safety Division.
3. SimplexGrinnell LP.

B. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.

C. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

D. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

E. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.

F. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

G. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Rated Light Output:
   a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

H. Voice/Tone Notification Appliances:

1. Comply with UL 1480.
2. Speakers for Voice Notification: Locate speakers for voice notification to provide the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
3. High-Range Units: Rated 2 to 15 W.
4. Low-Range Units: Rated 1 to 2 W.
5. Mounting: semirecessed or surface mounted and bidirectional.
6. Matching Transformers: Tap range matched to acoustical environment of speaker location.

I. Exit Marking Audible Notification Appliance:

1. Exit marking audible notification appliances shall meet the audibility requirements in NFPA 72.
2. Provide exit marking audible notification appliances at the entrance to all building exits.
3. Provide exit marking audible notification appliances at the entrance to areas of refuge with audible signals distinct from those used for building exit marking.

2.10 FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION SERVICE

A. Dedicated, two-way, supervised, telephone voice communication links between fire-alarm control unit and remote firefighters' telephone stations. Supervised telephone lines shall be connected to talk circuits by controls in a control module. Provide the following:

1. Common-talk type for firefighter use only.
2. Selective-talk type for use by firefighters and fire wardens.
3. Controls to disconnect phones from talk circuits if too many phones are in use simultaneously. An indicator lamp shall flash if a phone is disconnected from the talk circuits.
4. Addressable firefighters' phone modules to monitor and control a loop of firefighter phones. Module shall be capable of differentiating between normal, off-hook, and trouble conditions.

5. Audible Pulse and Tone Generator, and High-Intensity Lamp: When a remote telephone is taken off the hook, it causes an audible signal to sound and a high-intensity lamp to flash at the fire-alarm control unit.
6. Selector panel controls to provide for simultaneous operation of up to six telephones in selected zones. Indicate ground faults and open or shorted telephone lines on the panel front by individual LEDs.
7. Display: digital to indicate location of caller.
8. Remote Telephone Cabinet: Flush- or surface-mounted cabinet as indicated, factory-standard red finish, with handset.

    a. Install one-piece handset to cabinet with vandal-resistant armored cord. Silk-screened or engraved label on cabinet door, designating "Fire Emergency Phone."
    b. With "break-glass" type door access lock.

9. Remote Telephone Jack Stations: Single-gang, stainless-steel-plate mounted plug, engraved "Fire Emergency Phone."
10. Handsets: 2 push-to-talk-type sets with noise-canceling microphone stored in a cabinet adjacent to fire-alarm control unit.

2.11

2.12 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnets: Require no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.13 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.14 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to circuit-breaker shunt trip for power shutdown.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.15 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture [**one**] [**two**] telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.

2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.16 RADIO ALARM TRANSMITTER

A. Transmitter shall comply with NFPA 1221 and 47 CFR 90.

B. Description: Manufacturer's standard commercial product; factory assembled, wired, and tested; ready for installation and operation.

1. Packaging: A single, modular, NEMA 250, Type 1 metal enclosure with a tamper-resistant flush tumbler lock.
2. Signal Transmission Mode and Frequency: VHF or UHF 2-W power output, coordinated with operating characteristics of the established remote alarm receiving station designated by Owner.
3. Normal Power Input: 120-V ac.
4. Secondary Power: Integral-sealed, rechargeable, 12-V battery and charger. Comply with NFPA 72 requirements for battery capacity; submit calculations.
5. Antenna: Omnidirectional, coaxial half-wave, dipole type with driving point impedance matched to transmitter and antenna cable output impedance. Wind-load strength of antenna and mounting hardware and supports shall withstand 100 mph with a gust factor of 1.3 without failure.
6. Antenna Cable: Coaxial cable with impedance matched to the transmitter output impedance.
7. Antenna-Cable Connectors: Weatherproof.
8. Alarm Interface Devices: Circuit boards, modules, and other auxiliary devices, integral to the transmitter, matching fire-alarm and other system outputs to message-generating inputs of the transmitter that produce required message transmissions.

C. Functional Performance: Unit shall receive alarm, supervisory, or trouble signal from fire-alarm control unit or from its own internal sensors or controls and shall automatically transmit signal along with a unique code that identifies the transmitting station to the remote alarm receiving station. Transmitted messages shall correspond to standard designations for fire-reporting system to which the signal is being transmitted and shall include separately designated messages in response to the following events or conditions:

1. Transmitter Low-Battery Condition: Sent when battery voltage is below 85 percent of rated value.

2. System Test Message: Initiated manually by a test switch within the transmitter cabinet, or automatically at an optionally preselected time, once every 24 hours, with transmission time controlled by a programmed timing device integral to transmitter controls.
3. Transmitter Trouble Message: Actuated by failure, in excess of one-minute duration, of the transmitter normal power source, derangement of the wiring of the transmitter, or any alarm input interface circuit or device connected to it.
4. Local Fire-Alarm-System Trouble Message: Initiated by events or conditions that cause a trouble signal to be indicated on the building system.
5. Local Fire-Alarm-System Alarm Message: Actuated when the building system goes into an alarm state. Identifies device that initiated the alarm.
6. Local Fire-Alarm-System, Supervisory-Alarm Message: Actuated when the building alarm system indicates a supervisory alarm.

2.17 NETWORK COMMUNICATIONS

A. Provide network communications for fire-alarm system according to fire-alarm manufacturer's written requirements.

B. Provide network communications pathway per manufacturer's written requirements and requirements in NFPA 72 and NFPA 70.

C. Provide integration gateway using Modbus for connection to building automation system.

2.18 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by device manufacturer.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before all other trades have completed cleanup shall be replaced.
2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Equipment Mounting: Install fire-alarm control unit on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Equipment Mounting: Install fire-alarm control unit on finished floor.

D. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

E. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

F. Smoke- or Heat-Detector Spacing:

1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex Ain NFPA 72.
5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

G. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

H. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

I. Air-Sampling Smoke Detectors: If using multiple pipe runs, the runs shall be pneumatically balanced.

J. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

K. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

L. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

M. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

N. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

O. Device Location-Indicating Lights: Locate in public space near the device they monitor.

P. Antenna for Radio Alarm Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that resists 100-mph wind load with a gust factor of 1.3 without damage.

3.3 PATHWAYS

A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.

B. Pathways shall be installed in EMT.

C. Exposed EMT shall be painted red enamel.

3.4 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated HVAC duct systems.
4. Magnetically held-open doors.
5. Electronically locked doors and access gates.
6. Alarm-initiating connection to elevator recall system and components.
7. Alarm-initiating connection to activate emergency lighting control.
8. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
9. Supervisory connections at valve supervisory switches.
10. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
11. Supervisory connections at elevator shunt-trip breaker.
12. Data communication circuits for connection to building management system.
13. Data communication circuits for connection to mass notification system.
14. Supervisory connections at fire-extinguisher locations.
15. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
16. Supervisory connections at fire-pump engine control panel.

C. Connect two dedicated active telephone lines to the DACT; coordinate with communications system installer.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 REMOTE MONITORING SERVICE

A. Engage a licensed remote monitoring facility to monitor the fire alarm system. This shall be for a period of at least 12 months following substantial completion (full warranty period). The

Owner shall be the designated point of contact for the remote monitoring facility. After the first 12 months, monitoring service shall be transferrable to the Owner.

1. Provide a Contract option for the Owner to extend the remote monitoring service contract to 2, 3, 4 or 5 years, to be honored any time during the initial 12-month period.

B. If the Owner has a preferred licensed remote monitoring facility other than that proposed by the Fire Alarm subcontractor, credit Contract an amount equal to 1 year monitoring service and coordinate with Owner's monitoring service.

3.7 Program the DACT to dial the telephone number(s) of the licensed remote monitoring facility.

3.8 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.9 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by owner 's representative and authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.

6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.10 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.11 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.12 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111

SECTION 311000 SITE CLEARING

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. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping or sealing, and abandoning site utilities in place.
6. Temporary erosion and sedimentation control.

B. Related Requirements:

1. NA

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

C. Burning: Documentation of compliance with burning requirements and permitting of authorities having jurisdiction. Identify location(s) and conditions under which burning will be performed.

1.6 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify Miss Utility for area where Project is located before site clearing.

C. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

D. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting 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 Engineer not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 2 inches (50 mm) in diameter, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches (150 mm) in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Burning tree, shrub, and other vegetation waste is permitted according to burring requirements and permitting of authorities having jurisdiction. Control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties. Burning of other waste and debris is prohibited.

END OF SECTION 311000

SECTION 312000 EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Engineering Report dated April 23, 2026 by Hurt & Proffitt.

1.2 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for pavements and turf and grasses.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course and base course for asphalt paving.
5. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:
1. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping[**and stockpiling**] topsoil, and removal of above- and below-grade improvements and utilities.
3. Section 315000 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material 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: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and 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, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) 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. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucket-curling force of not less than 28,700 lbf (128 kN) and stick-crowd force of not less than 18,400 lbf (82 kN) with extra-long reach boom.
2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp (172-kW) flywheel power and developing a minimum of 47,992-lbf (213.3-kN) breakout force with a general-purpose bare bucket.

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: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.

1.5 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

B. Blasting plan approved by authorities having jurisdiction.

C. Seismic survey report from seismic survey agency.

1.6 QUALITY ASSURANCE

A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:

1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

C. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Engineer.

C. Utility Locator Service: Notify "Miss Utility" for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls "and Section 311000 "Site Clearing" are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, CL, ML and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and zero to 5 percent passing a No. 8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and zero to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C 33/C 33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:

    a. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
    b. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
    c. Tear Strength: 90 lbf (400 N); ASTM D 4533.
    d. Puncture Strength: 90 lbf (400 N); ASTM D 4833.

3. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
4. Permittivity: 0.02 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials, and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
a. 24 inches (600 mm) outside of concrete forms other than at footings.
b. 12 inches (300 mm) outside of concrete forms at footings.
c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
f. 6 inches (150 mm) beneath pipe in trenches and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3.4 EXPLOSIVES

A. Explosives: Do not use explosives.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, 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. Pile Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches (300 mm) each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.8 SUBGRADE INSPECTION

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.9 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, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill voids with satisfactory soil while removing shoring and bracing.

D. Place tracer wire along the top of nonmetallic pipe during backfill.

E. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

G. Warning Tape: Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course and base course to required crown elevations and cross-slope grades.
4. Place subbase course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.

5. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab but in no case fewer than three tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312319 DEWATERING

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 construction dewatering.

B. Related Requirements:
1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Existing Conditions: Using video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system 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 authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015400 "Erosion and Sedimentation Control," and Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed, and available for immediate operation, to maintain dewatering on a continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches (600 mm) below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.

3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks monthly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering systems during dewatering operations.

B. Promptly repair damage to adjacent facilities caused by dewatering.

END OF SECTION 312319

SECTION 313116
TERMITE CONTROL

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act.

1.02 COORDINATION

A. Integrated Pest Management: Coordinate and comply with Owner's in-place integrated pest management plan.

B. Coordinate with earth moving and excavation, and with foundation and concrete work, to provide treatments at appropriate stages of the work in accordance with manufacturer's recommended best practices and application instructions.

1.03 SUBMITTALS

A. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

B. Test Reports: Indicate regulatory agency approval reports when required.

C. Certificate of compliance from authority having jurisdiction indicating registration and approval of toxicants.

D. Applicator qualification statement.

E. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing this type of work and:

1. Approved by manufacturer of treatment materials.
2. Licensed in the State in which the Project is located.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year installer's warranty against damage to building caused by termites.

1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.

PART 2 PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.

1. Toxicant chemical shall be a non-repellant type based on fipronil as active ingredient, acting on termites through ingestion or contact. Alternate proposed toxicant shall be submitted as a substitution for review under Owner's Integrated Pest Management plan.
    a. Active ingredient shall not harm adjacent plant life and landscaping; and shall be demonstrated as safe/harmless for humans and domestic animals.

2. Limitations: Organophosphates (off market due to EPA ban) and pyrethroid treatments, including chorpyrifos and cypermethrine are not acceptable.

B. Diluent: Recommended by toxicant manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION - CHEMICAL TREATMENT

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray apply toxicant in accordance with manufacturer's instructions.

C. Apply toxicant at following locations:
   1. Under slabs-on-grade.
   2. Along both exterior and interior sides of foundations, including perimeter foundations, foundations and footings for interior partition walls, piers, and columns.
   3. Around penetrations through slabs such as plumbing pipes and electrical conduits.

D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.

E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

G. Re-treat disturbed treated soil with same toxicant as original treatment.

H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

END OF SECTION 313116

SECTION 321216 ASPHALT PAVING

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. Cold milling of existing asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt overlay.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for demolition and removal of existing asphalt pavement.
2. Section 312000 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
3. Section 321373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.
2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Material Certificates: For each paving material.

C. Material Test Reports: For each paving material, by a qualified testing agency.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements Road and Bridge Regulations of VDOT for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320, PG 64-22.

B. Asphalt Cement: ASTM D 3381/D 3381M for viscosity-graded material.

C. Emulsified Asphalt Prime Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

D. Tack Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Water: Potable.

F. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

A. Joint Sealant: ASTM D 6690 or AASHTO M 324, Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: BM 25: Thickness as indicated on Drawing.
3. Surface Course: SM 9.5A: Thickness as indicated on Drawings

B. Emulsified-Asphalt Slurry: ASTM D 3910, Type 2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work,

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.3 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of 1-1/2 inches (38 mm).
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
7. Keep milled pavement surface free of loose material and dust.
8. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.5 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.7 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F (121 deg C).

4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.8 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.9 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mic asphalt course has been uniformly compacted to the following density:
   1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent or greater than 100 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

   1. Base Course: Plus or minus 1/2 inch (13 mm).
   2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

   1. Base Course: 1/4 inch (6 mm).
   2. Surface Course: 1/8 inch (3 mm).
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 321216

SECTION 321313 CONCRETE PAVING

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 Concrete Paving including the Following:
1. Curbs and gutters. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.
6. Bonding agent or epoxy adhesive.
7. Joint fillers.

C. Material Test Reports: For each of the following:

1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

1.7 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars; assembled with clips.

E. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

F. Deformed-Steel Wire: ASTM A 1064/A 1064M.

G. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars**;** zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

H. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be 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 (800 km) of Project site.

B. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150/C 150M, white portland cement Type I/II.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 4M uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Water: Potable and complying with ASTM C 94/C 94M.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Axim Italcementi Group, Inc.; Caltexol CIMGILM.
   b. BAST Construction Chemicals, LLC; Confilm.
   c. ChemMasters; Spray-Film.
   d. Conspec by Dayton Superior; Aquafilm.
   e. Dayton Superior Corporation; Sure Film (J-74).
   f. Edoco by Dayton Superior; BurkeFilm.
   g. Euclid Chemical Company (The), an RPM company; Eucobar.
   h. Kaufman Products, Inc.; VaporAid.
   i. Lambert Corporation; LAMBCO Skin.
   j. L&M Construction Chemicals, Inc.; E-CON.
   k. Meadows, W.R., Inc. EVAPRE.
   l. Metalcrete Industries; Waterhold.
   m. Non-Crete Products Group; MONOFILM.
   n. Sika Corporation, Inc.; SikaFilm.
   o. SpecChem, LLC; Soec Film.
   p. Symons by Dayton Superior; Finishing Aid.
   q. TK Products, Division ofSierra Corporation; TK-2120 TRI-FILM.
   r. Unitex; PRO-FILM.
   s. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
   b. Chem Masters; Safe-Cure Clear.
   c. Conspec by Dayton Superior; D.O.T. Resin Cure.
   d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
   e. Edoco by Dayton Superior; DSSCC Clear Resin Cure.
   f. Euclid Chemical Company (The), an RPM company; Kurez W VOX.
   g. Kaufman Products, Inc.; Thinfilm 420.
   h. Lambert Corporation; AQUA KURE-CLEAR
   i. L&M Construction Chemicals, Inc.; L&M CURE R.
   j. Meadows, W.R., Inc.; 1100-CLEAR SERIES.
   k. Nox-Crete Products Group; Resin Cure E.

l. SpecChem, LLC; PaveCure Rez.
m. Symons by Dayton Superior; Resi-Chem Clear.
n. Tamms Industries, Inc., Euclid Chemical Company (The); TAMMSCURE WB 30 C.
o. TK Products, Division of Sierra Corporation; TK-2519 WB.
p. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.

F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
b. ChemMasters; Safe-Cure 2000.
c. Conspec by Dayton Superior; D.O.T. Resin Cure White.
d. Dayton Superior Corporation; Day-Chem Whit PigmentedCure (J-10-W).
e. Edoco by Dayton Superior; Resin Emulsion Cure V. O.C. (Type II).
f. Euclid Chemical Company (The), an RPM company; Kurez W VOX White Pigmented.
g. Kaufman Products, Inc.; Thinfilm 450.
h. Lambert Corporation; AQUA KURE-WHITE.
i. L&M Construction Chemicals, Inc.; L&M CURE R-2.
j. Meadows, W.R., Inc.; 1100-WHITE SERIES.
k. SpecChem, LLC; PaveCure Rez White.
l. Symons by Dayton Superior; Resi-Chem White.
m. Vexcon Chemicals Inc.; Certi-Vex Enviocure White 100.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Pozzolan: 25 percent.
2. Slag Cement: 50 percent.
3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
1. Air Content: 6 percent plus or minus 1-1/2 percent for 1-inch (25-mm) nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days):
   a. 3000 psi (20.7 MPa.) for curbs and gutters, walks
   b. 4000 psi (27.6 MPa) for driveways, roadways, and parking lot surfaces
2. Maximum W/C Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches (100 mm) plus or minus 1 inch (25 mm).

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
1. Completely proof-roll subbase in one direction.
2. Limit vehicle speed to 3 mph (5 km/h).
3. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
4. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use epoxy-bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a [**1/4-inch (6-mm)**] [**3/8-inch (10-mm)**] radius. Repeat grooving of contraction joints after applying surface finishes

    a. Tolerance: Ensure that grooved joints are within 3 inches (75 mm) either way from centers of dowels.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

    a. Tolerance: Ensure that sawed joints are within 3 inches (75 mm) either way from centers of dowels.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation**,** steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies**,** reinforcement**,** or side forms.

Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by curing compound or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:

1. Elevation: 3/4 inch (19 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-feet- (3-m-) long; unleveled straightedge not to exceed 1/2 inch (13 mm).
4. Joint Spacing: 3 inches (75 mm).
5. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
6. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide 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 C 143/C 143M; 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. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method; 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 C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if 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).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Additional Tests: 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.

F. Concrete paving will be considered defective if it does not pass tests and inspections.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

H. Prepare test and inspection reports.

3.11 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321723 PAVEMENT MARKINGS

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 painted markings applied to asphalt pavement.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.

B. Shop Drawings: For pavement markings.

1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Quality Standards for Work Zone Traffic Control Devices for pavement-marking work in compliance with VDOT 246 Road and Bridge Standards.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for alkyd materials 55 deg F (12.8 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint: High solids, fast drying waterborne traffic paint formulated specifically for airless equipment and conventional air atomized equipment with physical and color properties of paint conforming to VDOT specification.

B. Dries to no pickup in less than 10 minutes at 15 mils when ambient and surface temperatures are 75° F or higher at 50± 5% humidity.

C. Technical Data

• Total solid weight %	> 75
• Total solid volume %	> 62
• Total pigment weight %	59-63
• NVV at %	> 40
• Weight per gallon (min)	> 13.8
• Direct Reflect and @ 15 mils	80 (w)
• Wet Film	50 y
• VOC (gal/L)	<150
• pH	>10

D. Product

White	984601
Yellow	984602
Blue	

E. Glass Beads (only required on public roadways): AASHTO M 247, Type 1made of 100 percent recycled glass.

1. Roundness: Minimum 80 percent true spheres by weight in accordance with the requirements of ASTM D1155 Procedure B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

1. Application shall be performed when road temperature is 50 degrees F or above.

2. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
3. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal. (0.72 kg/L).

3.3 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

SECTION 323119.53
DECORATIVE SECURITY GATES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NFPA 70 - National Electrical Code.

D. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

E. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

F. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Verification Samples: Provide samples, minimum 12 inch in length, for each type of fence material and color.

D. Installer's Qualification Statement.

E. Manufacturer's Warranty: Provide executed warranty completed and registered in Owner's name.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified; Installer shall be certified installation representative of fence manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cantilever Security Gates:
   1. Ameristar Perimeter Security, USA (Basis-of-Design).
   2. Fortress Building Products.
   3. Iron Eagle Industries, Inc.
   4. Master Halco.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Bi-Folding Security Gates:
   1. Tymetal Corp (Basis-of-Design).
   2. Delta Scientific.
   3. Wallace Perimeter Security.

2.02 SECURITY GATES

A. Cantilever Gates:
   1. Basis-of-Design Product: Ameristar Transport Traverse II Cantilever Gate.
   2. Operation Type: Bi-parting; separate cantilever gates to each side that meet in middle.
   3. Total Height: 8 feet nominal.
   4. Gate Structure:
      a. Uprights: 2.5-inch square, 16 gauge ASTM A653 galvanized steel.
      b. Diagonal Supports: 2 inch square, 16 gauge ASTM A653 galvanized steel.
      c. Bottom Track: 3.75-inch by 6.5-inch aluminum tube profile.
      d. Top Track: 3 inch by 5.5-inch aluminum tube profile.
      e. Infill: Manufacturer's standard 1-inch square 16 gauge pickets, maximum 4" clear between pickets.
   5. Support Posts: Unless otherwise indicated, provide 6-inch square by 3/16-inch wall thickness, ASTM A653 galvanized steel posts.
   6. Hardware:
      a. Latch: Manufacturer's standard mechanism; factory finished galvanized steel.
      b. Truck Assembly: Manufacturer's standard, self-aligning, wheeled truck assembly supporting weight of gate plus 2,000 pound reaction load; provide number of truck assemblies per gate recommended by manufacturer.
      c. Guide Wheel Assembly: Manufacturer's standard, adjustable, dual wheel assembly; provide number of guide wheels per gate recommended by manufacturer.
   7. Operation: Automatic.
      a. Operator: Comply with UL 325, Class I and ASTM F2200.
      b. Manufacturer's standard electric operating system with integral controls, sensors, remote latching and unlatching, safety devices, communication devices, and emergency vehicle access.
      c. Provide a separate clearly marked pedestrian access for each entrance with automated gate.
   8. Color: Manufacturer's standard, factory applied Black.

B. Bi-Folding Gates:
   1. Basis-of-Design Product: Tymetal Securfold - Foldsmart Trackless Bi-Folding Gate System.

2. Total Height: 8 feet nominal.
3. Gate Panels: Manufacturer's standard steel tube framing sections
   a. Infill: Provide custom anti-climb wire mesh to match Division 32 section "Security Wire Fences and Gates."
4. Posts: 8-inch square with 1/4-inch wall thickness. Posts shall be anchored to concrete footings; coordinate with Division 3 concrete subcontractor for footing requirements.
5. Finish: All steel components shall be galvanized to ASTM A653 and have manufacturer's standard black powder-coat finish.
6. Operation: Automatic.
   a. Operator: Comply with UL 325, Class I and ASTM F2200.
   b. Manufacturer's standard electric operating system with integral controls, sensors, remote latching and unlatching, safety devices, communication devices, and emergency vehicle access.
7. Color: Manufacturer's standard, factory applied Black.

2.03 AUTOMATIC GATE OPERATORS

A. Sliding Gates: Prewired, post-mounted gate operators for horizontal sliding gates and for bi-folding gates, per ASTM F2200 and UL 325.
   1. Class: Class IV - Limited Access (Secure Facility).
   2. Operating type: Drive belt.
   3. Control Functions: Open, Pause, Close.
   4. Synchronization: For double gates, provide manufacturer's standard wired or wireless synchronization, with opening and closing delay to prevent overlaps or collisions, and with entrapment protection devices linked to ensure both gates stop and reverse in the event of an obstruction.
   5. Maximum Open/Close Time: 10 seconds.
   6. Access (Entry Gate): Card readers; pedestal mounted. Coordinate with Owner's Security/Access Control requirements. Refer to Division 5 Metal Fabrications for prefabricated pedestal.
   7. Access (Exit Gate): Provide vehicle loop detector at exit gate to open gate, hold gate open until traffic clears, and close gate. Provide adjustable detection functions, including a delay function so that gate will not be activated by incoming traffic parking in adjacent parking spots, but require car to idle over loop detector for a preset period of time (adjustable; approx. 3 seconds).
   8. Emergency Vehicle Access: At each vehicular gate operator, provide secondary emergency access control through radio transceiver, coordinated with local law enforcement and emergency response agencies. Provide “Click2Enter-LV4” or similar emergency receiver approved by local authorities, and all accessory wiring and components for a complete assembly to activate each gate operator from either side via radio. Coordinate radio frequencies with Owner and local agencies.
   9. Maximum gate weight: 500 pounds (187 kilograms).
   10. Electrical Requirements: 208-240V; 3 Phase; 60 Hz.
   11. Horsepower Rating: Suitable for connected load; 1/2 HP equivalent, minimum.
   12. Limit Switches: Automatically stops operation in the fully open or fully closed position.
   13. Manual Override Switches: Provide manual override switch at each gate. User shall be able to manually operate all gates in the event of power outage, or if manual override is activated.
   14. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.

a. Primary Device: Provide NEMA 4X photo eye sensors as required with momentary-contact control device.
b. Secondary Device: Provide electric sensing edge with wireless edge kit or non-monitored safety edge as an option along leading edge of each gate.

15. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
    a. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
        1) Outdoor Locations, direct splashing: Type 4.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Excavate post holls in size and depth in accordance with manufacturer's requirements.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

C. Set all posts in concrete footing, with top of concrete 2 inches below final grade.

D. When cutting rails immediately seal the exposed surfaces by:
    1. Removing metal shavings from cut area.
    2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
    3. Apply two coats of custom finish spray paint matching fence color.
    4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

E. Space posts according to the manufacturers' drawings, dependent on standard maximum panel dimensions. For gates, space according to gate leaf dimensions, and gate hardware selected.
    1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.

F. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.04 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.

3.05 CLEANING

A. Clean fence with mild household detergent and clean water rinse well.

B. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION 323119.53

SECTION 323126
SECURITY WIRE FENCES AND GATES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

D. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test.

E. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets.

F. ASTM F2453 - Standard Specification for Welded Wire Mesh Fence Fabric (Metallic-Coated or Polymer Coated) for Meshes of 6 in.² or less, in Panels or Rolls, with Uniform Meshes.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Verification Samples: Provide samples, minimum 12 inch in length, for each type of fence material and color.

D. Installer's Qualification Statement.

E. Manufacturer's Warranty: Provide executed warranty completed and registered in Owner's name.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified; Installer shall be certified installation representative of fence manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Security WIre Fences and Gates:
   1. Basis-of-Design: Ameristar Perimeter Security, USA; WireWorks Anti-Climb.
   2. AMICO Perimeter Security; AMIGUARD 5000.
   3. Betafence USA; Securifor 3D.
   4. Cochrane Global; ClearVu.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 SECURITY WIRE FENCES AND GATES, GENERAL

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
   1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.

B. Electro-Deposition Coating: Multistage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
   1. Total Coating Thickness: 2 mils, minimum.
   2. Color: As selected by Architect from manufacturer's standard range.
   3. Coating Performance: Comply with general requirements of ASTM F2408.
      a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
      b. Impact Resistance: ASTM D2794; 60 inch pounds.

C. Steel: ASTM A653/A653M; tensile strength 45,000 psi, minimum.
   1. Hot-dip galvanized; ASTM A653/A653M, G90.
   2. 62 percent recycled steel, minimum.

D. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.
   1. Provide tamper-proof security bolts.

2.03 MECHANICALLY FASTENED AND WELDED STEEL WIRE FENCE

A. Basis-of-Design Product: Ameristar; WireWorks Anti-Climb.

B. Fence Panels: Horizontally oriented steel mesh panels; minimum 8 feet (96 inches) high by maximum 8 feet long.
   1. Panel Construction: Steel wire mesh panels; galvanized before welded; fabricated in accordance with ASTM F2453.
   2. Wire Size: Minimum 10.5 gauge (0.128 inch) thickness for both horizontal and vertical wires.
   3. Spacing: Horizontal wires spaced at 1/2-inch o.c. nominal, and vertical wires spaced at 3 inches o.c. nominal.
   4. Exposed Ends: Do not field cut wire; factory treat all exposed ends of wires with manufacturer's zinc phosphate electrodeposition coating.
   5. Panel Strength: Capable of supporting 600 pound load applied at midspan without deflection.

6. Attach panels to posts with manufacturer's standard wire mesh panel brackets with tamper-resistant fasteners.

C. Posts: Steel tube.
   1. Size: Nominal 2-1/2 inch square, by 16 gauge, unless otherwise required by manufacturer for fence height indicated; with manufacturer's standard cap.

D. Rails: Manufacturer's standard, double-wall steel channel; 2 inch by 2 inch square by 11 gauge, 0.1196 inch, unless otherwise required by manufacturer for spacing.
   1. Rail Quantity: 3 total on secure side of fence. Intermediate horizontal rail may be omitted when panels include integral "V" shape reinforcement pattern for structural rigidity.

E. Gates: Provide manufacturer's recommended framing member size for vertical and horizontal components, with welded corner plate reinforcing in each corner. Panel infill shall match fence panels.
   1. Fabricate single gates so that here is no more than 1/2 inch gap at latch, and double gates so that there is no more than 1 inch gap at latch.

F. Flexibility: Not intended to follow variable slope; provide stair-stepping as required to accommodate slope and maintain a minimum 96 inch height above grade level.

2.04 GATE HARDWARE

A. Hardware: Provide the following at each manual swinging gate indicated. Gate operation shall be by presentation of credential at card reader to release electric strike, or via key in night latch rim cylinder. Free egress from interior via push lever exit device at all times. Finish shall be selected from manufacturer's full range except as indicated.
   1. Hinge/Closer Set: Provide heavy-duty exterior grade gate closer/hinge combo with minimum 440 lb gate load; provide with additional hinge at bottom hinge. Basis-of-Design is Locinox; Mammoth 180 degree; black finish.
   2. Exit Device: Provide exterior grade exit device with grooved/textured trim and with night-latch pull-side trim. Exit device shall have waterproof, request-to-exit function. Basis-of-Design: Von Duprin WP-RX-99L-NL x 996L-NL. Size for gate width indicated.
      a. Security Steel Plate Infill: Provide steel plate welded to latch side gate frame, sized as required to cover gate clearance between frame and adjacent fence post. Steel plate shall prevent access by reaching through clear opening and activating exit device from the exterior. Finish plate to match gate frame.
   3. Rim Cylinder: Provide exterior grade rim cylinder compatible with latchway and compliant with Owner's existing Medeco keyway system. Basis-of-Design: Medeco 33702042; verify in field with Owner's keying system.
   4. Electric Strike: Exterior grade, surface mounted electric strike with decorative, tapered cover; compatible with submitted rim exit device. Provide with manufacturer's standard latchbolt strike monitor, and with manufacturer's standard power controller to protect unit from power surge. Basis-of-Design is HES 9500-LBSM x 2005M3.
   5. Power Supply: Dual voltage, 2 Amp power supply. Basis-of-Design: Securitron AQD2.
   6. Wiring Harness: Manufacturer's standard plug-and-play type. Basis-of-Design: McKinney QC-C1500P.
   7. Position Switch: Surface mounted, magnetic contacts mounted on push side (interior) of gate. Basis-of-Design: Interlogix 2707A.

2.05 ACCESSORIES

A. Post Caps: Cast steel galvanized; with sloped top, and sized and finished to match posts; set screw retainer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Excavate post holls in size and depth in accordance with manufacturer's requirements.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

C. Set all posts in concrete footing, minimum 36 inches deep unless otherwise required by manufacturer, with top of concrete 2 inches below final grade.

D. When cutting rails immediately seal the exposed surfaces by:
   1. Removing metal shavings from cut area.
   2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
   3. Apply two coats of custom finish spray paint matching fence color.
   4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

E. Space posts according to the manufacturers' drawings, dependent on standard maximum panel dimensions. For gates, space according to gate leaf dimensions, and gate hardware selected.
   1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.

3.04 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.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Post Settings: Randomly inspect three locations against design for:
   1. Hole diameter.
   2. Hole depth.
   3. Hole spacing.

D. Gates: Inspect for level, plumb, and alignment.

3.06 CLEANING

A. Clean fence with mild household detergent and clean water rinse well.

B. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.07 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION 323126

SECTION 331113 PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Ductile-iron pipe and fittings.
2. PEX tube and fittings.
3. PVC pipe and fittings.
4. Polytech pipe and fittings

B. Related work described elsewhere:
1. Section 033000 - "Cast-In-Place Concrete" for installing pipe supports and thrust blocks when required in leu of restrained joint fittings.
2. Section 312000- "Earthwork" for tracer wire for detecting nonmetallic piping.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

B. PE: Polyethylene Plastic.

C. HDPE: High Density Polyethylene

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
1. Wiring Diagrams: Power, signal, and control wiring for alarms.

1.5 INFORMATION SUBMITTALS

A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

B. Field quality-control test report.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with the requirements of a utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with the standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. NSF Compliance:
1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water including marking "NSF-pw" on piping.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

E. Comply with ASTM F645 for selection, design, and installation of thermoplastic water piping.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flanged faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use woven fiber pipe slings to handle pipes, valves, and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited. Off-loading devices such as chains, wire, rope, chokers, or other piping handling

implements that may scratch, nick, cut, or gorge pipes are strictly prohibited. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the engineer.

D. Pipe shall be off-loaded, loaded, installed, handled, stored, and stacked per the pipe supplier's guidelines. These guidelines include compliance with the minimum recommended bend radius and maximum safe pull force for the specific pipe being used and in accordance with AWWA M23.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. All pipes shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer. Any bituminous pipe coating that is damaged by shipment or by the Contractor shall be repoured prior to installation. This shall be done by removing but the damaged coating wire brushing to expose the metal and applying two coats of bituminous coating material of a type and quality equal to the original coating.

H. Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.

I. If appropriate unloading equipment is not available, pipes may be unloaded by removing individual pieces. Care should be taken to ensure that the pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

J. Any length of pipe showing a crack, or which has received a blow that may cause an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.

K. Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matters.

L. If the pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. The pipe should be covered with opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.

M. Store plastic piping protected from direct sunlight-support to prevent sagging or bending.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with the interruption of water-distribution service without the Owner's written permission.

1.9 COORDINATION

A. Coordinate connection to water main with utility company.

1.10 WARRANTY

A. All pipes and valves shall be warranted for one year per the pipe supplier's standard terms.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Potable-water piping, and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151 centrifugally cast-in-metal molds or sand, lined molds for water and other liquids, with mechanical-joint bell and plain spigot end unless flanged ends are indicated. All pipes and fittings should be cement lined with a bituminous seal coat conforming to AWWA C104 and bear the NSF 61 seal for potable water. Ductile iron piping and fittings shall be coated outside with an asphaltic coating approximately one mil thick per AWWA C151 for ductile iron pipe, AWWA C115 for flange pipe and AWWA C110 and C153 for fittings.
   1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern including coatings per AWWA C104 and C153 plus NSF 61 approved.
   2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Join, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless flanged ends are indicated.

1. Push-on-Join, Ductile-Iron Fittings: AWWA C110 or ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern including coatings per AWWA C104 and C153 plus NSF 61 approved.
2. Gaskets: AWWA C111, rubber.

C. Flanges: ASME 16.1 Class 125, cast iron.

D. Joints
1. All exposed fitting within buildings and structures and fitting below structures shall be Class 125 flanged fittings in accordance with AWWA C115/A21.15 and ANSI B16.1. All flanges shall be finished flat faced for full area gasket bearing and shall be back faced or have the back face spotted for full bearing of the nut.

2. Flanges shall be furnished with factory punched full face gaskets 1/16-inch-thick, as manufactured by Crane Co., Chicago; Anchor Packing Co., Philadelphia, Garlock Packing Co., Palmyra, or equal. Steel regular unfinished square head machine bolts shall have threaded US National Coarse Threads Series, ANSI B1.1., Class 2 Fit, and shall be furnished with heavy pattern unfinished hex nuts, ANSI B18.2. After threading bolts or tapping nuts, threads shall be coated with a rust preventive lubricant and bolts and nuts packaged separately.
3. All below grade pipe fittings outside of buildings and structures shall be mechanical joints. The mechanical joint shall be of the stuffing box type and shall conform to the latest revisions of ANSI A21.11. The joint consists of a bell cast integrally with the pipe or fitting provided with an exterior flange having cored or drilled bolt holes and an interior annular recess for receiving the sealing gasket and straight spigot end of the pipe or fitting, a wedge shaped sealing gasket of a vulcanized rubber especially compounded for sewage or water, a separate cast iron follower gland having cored or drilled bolt holes, and high strength cast iron tee head bolts threaded US National Coarse Treads, Class 2 Fit, in accordance with American National Standard Institute (ANSI) B1.1 furnished with heavy pattern steel hex nuts. After threading or tapping, threads shall be coated with a rust preventative lubricant. Push-on or other types of joints may be used with the approval of the Engineer.

E. Cutting, Cleaning and Inspecting Ductile Iron Pipe: The cutting of pipe for closure pieces or for other reasons, shall be done in a neat and workmanlike manner by a method which will not damage the pipe or its liner. Unless approved by the Engineer, all cutting of such pipe shall be done by means of a mechanical cutter of an approved type. Wheel cutter shall be used wherever practical. After cutting, the interior of the pipe shall be thoroughly swabbed or cleaned of all foreign matter and shall be kept clean during and after installation. Before installation of any pipe and fittings, each piece shall be inspected for defects and shall be rung with a light hammer to detect any cracks. All defective, damaged, or unsound pipes or fittings shall be rejected.

2.3 PVC PIPE AND FITTINGS

A. PVC, AWWA Pipe: PVC Pipe 4 inches throughout 12 inches shall conform to AWWA C900, (PVC) with bell end with gasketed joint shall meet the requirements of ASTM D-3139, and the joint gasket shall conform to ASTM F-447. The material shall equal of exceed cell class 12454 as defined in ASTM-D 1784. The pipe provided shall be cast iron pipe equivalent O.D. Pipe shall be pressure Class 235 (DR-18) unless shown otherwise on the drawings. Pipe shall bear the National Sanitation Foundation 61 seal for potable water pipe.
   1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile-or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
      a. Gasket: AWWA C111/ASTM F-477, rubber.
   2. Mechanical-Joint, Ductile-Iron Fittings: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
      a. Glands, Gaskets, and Bolts: AWWA C111/ASTM F-477, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 PEX TUBE AND FITTINGS

A. Tube Material: PEX plastic less than 2-inch shall be in according to ASTM F 876 and meeting the NSF Standard 61 for potable water.

B. Fittings: ASTM F 1807, metal insert and copper crimp rings.

C. Fittings: ASSE 1061, push-fit fittings.

2.5 POLYTECH PIPE AND FITTING

A. Tubing Material: Waterline 2-inch in diameter to be SIDR7 Polytech pipe 250 PSI Blue Ultra-potable water piping. The ID shall be 2-inches or greater.

B. To be approved NSF 61, PE 4710, and ASTM D2239 certified.

C. Fittings: Approved Brass compression fittings suitable for SIDR7 Polytech piping.

2.6 JOINT RESTRAINTS

A. Install restraints at joints as indicated in the **Restrained Pipe Detail** provided in the Drawings or where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, anchoring and joint restraint methods shall be utilized. Alternate methods shall be used only when shown on the drawings or with the approval of the Engineer. Where tie rods or restrained joint systems are used, the number of joints to be restrained shall be determined in accordance with details shown on Drawings. Method that relies on the use of friction clamps and/or retainer glands with set screws alone are not acceptable. All restraining appurtenances and tie rods shall be coated with approved bituminous paint after assembly. The completed joint be inspected, and the paint repaired/touched up as necessary.

B. Mechanical joint restraints shall be incorporated in the design of the follower gland and shall include a restraining mechanism which consists of a plurality of individually actuated gripping

surfaces that impacts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Glands shall be manufactured of ductile iron conforming to ASTM A 536-80.

C. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA C111/A21.11 and ANS/AWWA C153/AA21.53 of latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices.

D. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1. Restraining glands for PVC pipe shall have a pressure raring equal to that of the pipe on which it is used. The restraining glands shall have been tested to UNI-B-13-92, be listed by Underwriters Laboratories, and be approved by Factory Mutual.

E. Restrained joint system for standard mechanical joint or push on joint pipe shall be Megalug or Coverall by EBAA Iron Sales, Inc., Eastland, TX; Fast-grip joint by American Cast Iron Pipe Company, Birmingham, AL; Field Lok 350 Gasket by United States Pipe and Foundry Company, Birmingham, AL; Sigma Corporation; Stargrip Series 3000uctile Iron and Series 4000 for PVC manufacturer by Star Pipe Products or approved equal.

F. Two-piece pipe restrainers for AWWWA C900 PVC shall be equal to Star Pipe Products Series 1100C Bell restrainer.

2.8 LINK SEALS

A. Provide a Link Seal by Thunderline Corporation or approved equal at all pipe wall penetrations.

2.9 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1 AWWA C110/A21.10, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.

2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.10 COUPLINGS AND ADAPTERS

A. All sleeve type couplings where shown on the plans shall be designed to fit accurately the outside diameters of the pipe to which they are to connect. Gaskets shall be molded rubber. Couplings shall be furnished completely with bolts, nuts, and gaskets. Middle rings shall be

made up with a pipe stop and shall be at least as thick as the steel pipe and with follower rings of appropriate thickness. Middle rings for couplings used on cast iron pipe shall be at least 3/8 inch thick. Middle rings shall be not less than 7inches wide. Couplings shall be installed in strict accordance with the recommendations of the manufacturers. Couplings shall be equal to Dresser Style 153, Romac 501 or Dresser Style 128 when specified. Provide Type 304 stainless steel bolts and nuts. MJ anchor couplings shall be Clow or approved equal.

B. Flanged Adapters-Flanged adapters shall be cast iron construction and manufactured to meet ASTM A-126, Class B.

C. All flexible couplings shown on the piping plans shall be constructed of flexible neoprene having elastomeric bellows with ball-shaped design manufactured of multiple pliers of nylon cord fabric and neoprene, both molded and cured in hydraulic rubber pressures. Couplings shall be rated for a minimum of 250 psi at 220-degree F.

2.11 GATE VALVES

A. AWWA, Cast-Iron Resilient Wedge Gate Valves:
   1. Manufacturers: Subject to compliance with requirements, provided products by the manufacturers specified:

      a. McWane, Inc.: Kennedy Valve Div. Model KS-FW
      b. Mueller Model A-2361
      c. M&H
      d. Or Approved Equal
   2. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves for Buried Service:
      a. Description: Ductile-iron body and bonnet; with bronzed or ductile-iron gate, resilient seats, bronze stem, and stem nut:
         1) Standard: AWWA C509.
         2) Minimum Pressure Rating: 200 psig (1380 kPa).
         3) End Connections: Mechanical joint (unless otherwise noted).
         4) Interior Coating: Complying with AWWA C550.
   3. OS&Y, Rising-Stem, Resilient-Seated Gate Valves for Non-Buried Service:
      a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.
         5) Standard: AWWA C509.
         6) Minimum Pressure Rating: 200 psig (1380 kPa).
         7) End Connections: Flanged.
   4. The wedge on 2-48" shall be ductile iron, encapsulated with EPDM rubber on 54" and larger the EPDM rubber seat shall be mechanically retained to the disc to create a seal in both directions, at rated pressure in the closed position. The wedge shall be male guided into the body seat of the valve, plastic wedge guiding mechanism not allowed. The valve stem shall be AISI stainless steel with an integral stainless-steel stem thrust collar (machined as part of the stem). Shaft seals must be EPDM triple O-rings positively located in the grooves on the shaft not in the glad for NRS valves. The valves must have two thrust washers constructed of copper; non-metallic thrust washer is not acceptable. Non-Asbestos Graphite Packing must be used on OS&Y Valves. The valve body and

handwheel or nut shall be constructed of Ductile Iron and coated in and out per AWWA C550 with an ANSI/NSF 61 certified coating a minimum of 12 mils thick. All nuts, bolts and washers shall be stainless steel. End connections shall be flange or mechanical joint. Valves 18" and larger shall be equipped with a bevel or spur gear operator.

2.12 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:
   1. Manufacturers: Subject to compliance with requirements, provided products by the manufacturers specified.
      a. Romac Industries, Inc. Model SST
      b. Or Approved Equal
   2. Description: Sleeve and valve compatible with drilling machine.
      a. Standard: MSS SP-60 and AWWA C223.
      b. Tapping Sleeve: Stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
      c. Valve: AWWA, cat-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
      d. Gasket shall be gridded version SBR compound for water service. Gasket shall conform to ASTM D2000-80M 4AA 60T. A full gasket is required with an outlet gasket being Buna-N.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, top with lettering "WATER", and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.

C. Extension Stems shall be made of stainless steel 304 diameter to safely withstand the opening and closing thrust encountered in operation of the valves. The exact length of all extension stems shall be determined by measurements in the field.

D. Stem Guides shall be cast iron and bronze bush. The guides shall be adjustable in two directions to provide full adjustment for proper alignment with the stem. The slenderness ratio (L4) of the stem shall not exceed 200. Guides shall be spaced as shown on the Drawings.

E. A circular precast collar shall be installed around all valve boxes.

F. Where floor stand and operator are shown, operator shall be gear-reduction hand cranked unless specified otherwise.

2.14 RELIEF VALVES

A. Combination Air Valves for Water
   1. Manufacture: Subject to compliance with requirements, products by the manufacturer specified
      a. Crispin Model UL Universal for water mains.

b. Or Approved Equal

2. Description: Float-operated, hydromechanical device to automatically release accumulated air or to admit air.

a. Standard: AWWA C512.
b. Pressure Rating: 300 psig (2070 kPa).
c. Body Material: Cast iron or ductile iron ASTM A126 or ASTM A536.
d. Trim Material: Stainless steel, ASTM A240 and ASTM A276.
e. Inlet and Outlet Size: Size as specified.
f. Interiors and Exteriors Coating: NFS 61 certified fusion bond epoxy in accordance with AWWA C550.
g. Orifice: Provide 3/16" orifice to release an accumulation of air at a capacity of 54.6 scfm and pressure of 150 psig.

2.15 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:
1. Manufacturer: Subject to compliance with requirements, products by the manufacturer specified.
a. Muller Company: Water Products Div. Model A-423 Centurion.
b. Or Approved Equal.

2. Description: Freestanding, with one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, 5-1/4-inch (133-mm) main valve, drain valve, and NPS 6 (DN 150) mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have a cast-iron body, compression-type valve opening against pressure and closing with pressure. Hydrant shall be breakaway, safety ground flange for depth specified on Drawing.
a. Standard: AWWA C502.
b. Pressure Rating: 200 psig (1379 kPa) minimum.
c. Outlet Threads: NFPA 1963, with external hose thread used by the local fire department. Include cast-iron caps with steel chains.
d. Operating and Cap Nuts: Pentagon, 1-1/2 inches (38 mm) point to flat.
e. Direction of Opening: Open hydrant valve by turning an operating nut to the left or counterclockwise.
f. Exterior Finish: Red alkyd-gloss enamel print, unless otherwise indicated by Owner to match their color code.

2.16 WATER SERVICE CONNECTIONS

A. Manufacturers:

Subject to compliance with requirements, products by the manufacturers specified.

B. General:
Water service (Customer connector) shall be installed as shown on Drawings at location

designated on Drawings or directed by Owner or their representative capable and ready for operation.

C. Water Lateral Tubing:
1. Service tubing shall be Municipex or approved equal consisting of the following:
a. Cross-linked polyethylene (PEX a) pipe.
b. Conform to cell classification of 354400 in accordance with ASTM D3350.
c. Conform to ASTM D 2765, Method B.
d. Formed with co-extruded UV shield made from UV-resistant, high-density polyethylene color blue, UV shield to resistant exposure to natural sunlight for up to one year.
e. Certified by an approved testing agency to standards.
1) ASTM F876, F877 and F 2023
2) CSA B 137.5
3) NFS 61
4) PP1 TR 4
f. Conform to copper tubing sizes (CTS) SDR 9 AWWA C800 compression joint valves and fittings.
g. The casing beneath the road for water service tubing shall be 2-inch HDPE in compliance with ASTM D3035 with a minimum cell classification of 445474C. Pipe shall be manufactured by an ISO 9001 certified manufacturer.

D. Corporation Stops:
1. Corporation stops shall be of size as specified and tapped into the water main at an approximate angle of 45 degrees from vertical as shown in Drawings.
2. The materials and installation of corporation stops shall comply with the applicable AWWA specifications and shall be Mueller Corp. Stop ball valve brass "cc" x 110 CTS Part #B25008N AWWA/CC Taper. No approved equal.
3. Service saddles shall be ROMAC Industries, Inc. Model 202S.

E. Copper Setters:
1. Check valves shall be built into the setters. Listed below are the approved types of setters that the Owner uses:
a. Muller Model P-2470-2A
b. AY McDonald Meter Setter Model 722-212WD22-33
c. Ford Model VBH72-9W-44-xx-NL

2.18 VALVE MARKER

A. Manufacturer: Subject to compliance with requirements, products specified by the manufacturers.
1. Rhino Marking and Protection Systems. A division of REPNET, INC., Model Rhino Triview Markers and Rhino Triview Test Station.
a. Tracer Wire Test Station shall be installed as designated on Drawing.
2. Or Approved Equal

B. Markers shall be UV stable and face resistant. Marker shall be 360º visibility and color as listed below:
   1. Water: Blue.

2.19 WATER METER

A. Manufacturer: Subject to compliance with requirements, products by the manufacturers specified below.
   1. Master Meter Bottom Load Multi-Jet (BLMJ). No equal.
   2. Sensus SRII

B. The meter shall meet ANSI/AWWA Standard C708, most recent revision. Compliant with SDWA, NSF ANSI 372 and NSF 61 Standards.
   1. Standard Direct Read, DIALOG 3G AMR System registers, AccuLinx Encoder, and IP 68 Electrical Output registers available.
   2. Direct, proximity (touch), mobile AMR, and Fixed Network AMI.
   3. Permanently sealed with a scratch resistant glass lens, stainless steel base and wrap-around gasket to prevent intrusion of dirt or moisture.
   4. Registration available in U.S. gallons.

C. The meter box shall be Capital Foundry of Va. Inc. Model MBX-2 12 inches or 18 inches tall.

D. AMI: The AMI transmitters will be MXU SmartPoint Model 520M for pit applications manufactured by Sensus.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS:

A. General: Use pipe, fittings, and joining methods for piping system according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, and specified fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
   2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL:/FMG, cast-iron, nonirising-stem gate valves with indicator post.
   3. Use the following for valves in vaults and aboveground:
      a. Gate Valves, NPS 2 (DN 50) and Smaller: Bronze, rising stem.
      b. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.
      c. Check Valves: AWWA C508, swing type.

   4. Relief Valves: Use for water-service piping in vaults and aboveground.
      a. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
      b. Combination Air Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

3.4 PIPING INSTALLATION

A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

B. Make Connections larger than NPS 2 (DN 50) with tapping machine according to the following:
   1. Install tapping sleeve and tapping valve according to MSS SP-60.
   2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
   3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
   4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

C. Make connections NPS 2 (DN 50) and smaller with drilling machine according to the following:
   1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
   2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.

3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

D. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41 and PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

E. Lining Up Bell and Spigot Pipe-Pipe lines or runs intended to be straight shall be so laid. Deflections from a straight line or grade, made necessary by vertical curves or horizontal curves or offsets, shall not exceed that recommended by the manufacturer of the pipe or approved by the Engineer. If the specified or required alignment requires deflections more than those stipulated above, the Contactor shall provide either special bends as approved by the Engineer, or pipes in shorter lengths in such length and number that the annular deflections at any joint, as required by the specified maximum deflections, are not exceeded.

Maximum horizontal deflections for ductile iron pipe shall be as follows for an eighteen-foot joint of pipe:

MAXIMUM DEFLECTION IN INCHES

Size Pipe	MJ	Push-on-Joint
2", 4", 6"	27"	19"
8"	20"	19"
10"	20"	19"
12"	20"	19"
16"	13.5"	19"
18"	11"	19"
20"	9"	19"

Maximum horizontal deflections for PVC pipe shall be per manufacturer's recommendations. The Contractor shall obtain the maximum deflection information from the PVC manufacturer prior to construction. The Contractor shall give copies of the information to the Owner and Owner's Representative.

F. Laying Pipe in Trench
1. Each pipe length, having been properly cleaned and tested, shall be laid on the previously graded trench bottom after the bell hole has been dug; after proper joint cleaning, the joint gasket or rubber ring, if used, shall be placed on the pipe spigot as recommended by manufacturer.
2. Where conditions are, in the opinion of the Owner's Representative, unsuitable for laying pipe because of weather or trench conditions, the Contractor shall be required to cease

work until permission is given by the Owner's Representative for work to commence again providing such conditions have been corrected.

a. Only proper and suitable tools and appliances for the safe and convenient handling and laying of pipes and fittings shall be used. Pipe, fittings, and valves shall be carefully handled and lowered into the trench. Under no circumstances shall any pipe or fittings be dumped or rolled into a trench or be allowed to drop against the pipe or fitting already in the trench. Great care shall be taken to prevent the pipelining and coating from being damaged, any lining or coating damaged in any way shall be repaired by the Contractor to the satisfaction of the Engineer. Before being lowered and while suspended, the pipe shall be inspected for defects and ductile iron pipe rung with a light hammer to detect cracks. Defective, damaged, or unsound pipes will be rejected.

b. The interior of the pipe shall be thoroughly cleaned of all foreign matters before being lowered into a trench and shall be kept clean during laying operations by means of plugs or other approved methods. The pipe shall not be laid in water or when the trench or weather conditions are unsuitable for such work. When work is not in progress, open ends of pipe and fittings shall be closed securely so that no trench water, earth, or other substances will enter the pipe or fittings.

c. The full length of each section of the underground pipe shall rest solidly upon the pipe bed, and any defects due to settlement shall be made good by the Contractor at his own expense. The ends of pipe shall abut against each other in such manner that there shall be no shoulder or unevenness on the side of the main. Bell holes shall be dug sufficiently large to ensure the making of proper joints. Special precautions shall be exercised to prevent any pipe from resting on rock.

d. Any pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Any pipe, pipe fittings, or appurtenances found defective after installation shall be replaced without additional expense to the Owner.

e. Except where otherwise necessary in making connections or closures, or as authorized by the Engineer, bell-and-spigot pipe shall be laid with bells facing in the direction of flow for pressure pipe and bells on upstream for gravity pipe.

f. Where pipe cutting is necessary, it shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorized, cutting shall be done by means of an approved type of mechanical cutter which will leave a smooth end at right angles to the axis of the pipe and not otherwise damage the pipe lining. Wheel cutters shall be used when practicable.

g. Jointing

   1) Mechanical joints and push-on joints on ductile iron and PVC pipe and fittings shall be made in accordance with the recommendations of the joint manufacturer, as approved.

   2) Permissible Deflection of Joints

      a. No spring of joints to effect a change in direction will be allowed except by permission or direction or as shown on the drawings.

      b. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, the amount of deflection shall not exceed that recommended by the pipe or joint manufacturer.

      c. If the required alignment necessitates greater deflections, special bends approved by the Engineer or shorter lengths of pipe to provide angular deflection within acceptable limits shall be furnished.

      d. Alternate methods of jointing pipe will be considered by the Engineer if the Contractor furnishes satisfactory evidence that the proposed

alternate method has been used successfully and is acceptable to the manufacturer of the pipe and agreed to by the owner.

3. Pipe excavation shall be kept free from water, and no joint shall be made under water. The Contractor shall always be careful during backfilling to prevent damage to or disturbing joints and to protect the watertight integrity of the pipes. There shall be no walking on or working over pipe until backfill is over pipe. Backfilling shall be commenced by depositing and tamping earth layers not more than 4 inches thick around and over the pipe to a point not less than 1 foot in depth over the top, after which backfilling of the remainder of the trench may proceed.
4. Sheeting and shoring shall be in accordance with construction methods established in the Associated General Contractors of America Safety Code. The Contractor shall follow this AGC Manual in determining whether sheeting and shoring is required and shall follow the AGC recommended procedure for installation.
5. Thrust Blocks are optional in leu of retrained joint fittings.
    a. Plugs, caps, tees, and bends, vertically or horizontally, on pressure main to be provided with thrust blocking where indicated on the plans or elected by the contractor to use and shall comply with the REACTION BLOCKING detail shown in Drawing.
    b. Thrust blocking shall be concrete, minimum 2,000 psi.
    c. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of the thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be shown in drawings or directed by the Engineer.
    d. Blocking shall be placed so that the fitting joints will be accessible for repair.

    NOTE: Mechanical joint restraint and rodding will be required and thrust blocks are additional when required to ensure no movement of piping,

G. Bury piping with depth of cover over top at least 30 inches 750 mm) with top at least 12 inches (300 mm) below level of maximum frost penetration, and according to the following:
    1. Under Driveways: With at least 36 inches (910 mm) cover over top.
    2. Under Railroad Tracks: With at least 48 inches (1220 mm) cover over top.

H. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

I. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

J. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
    1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

K. Install underground piping with restrained joints at horizontal and vertical changes in direction at the distance shown on the Drawings. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

3.5 JOINT CONSTRUCTION

A. Make pipe joints according to the following:
   1. Ductile-Iron Piping, Gasketed Joints for Piping: AWWA C600 and AWWA M41.
   2. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900 and C905. Construct joints with elastomeric seals and lubricants according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.

B. Joints for PEX Tubing: Join according to ASTM F 1807 for metal insert and copper crimp ring fittings and ASTM F 1960 for cold expansion fittings and reinforcing rings.

C. Joints for PEX Tubing: Join according to ASSE 1061 for push-fit fittings.

D. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.6 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
   1. Locking mechanical joints.
   2. Set-screw mechanical retainer glands.
   3. Bolted flanged joints.
   4. Heat-fused joints.
   5. Pipe clamps and tie rods.
   6. Concrete thrust blocks along with any of the above combinations.

B. Install anchorages for tees, plugs, caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
   1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
   2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.9 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves.

C. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

3.10 PROTECTIVE ENCLOSURE INSTALLATION

A. Install concrete base level and with top approximately 2 inches (50 mm) above ground.

B. Install protective enclosure over valves and equipment.

C. Anchor protective enclosure to concrete base.

3.12 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. AWWA Fire Hydrants: Comply with AWWA M17.

C. Hydrant assemblies shall be installed such that all connecting piping has the same minimum of cover as does the main. All hydrants shall stand plumb and hydrant safety flanges shall be at

ground level after final grading. Nozzles shall be a minimum of 12 inches above finished grade unless otherwise noted.

D. Prior to assembly, all components shall be thoroughly cleaned of dirt and other foreign matters. All lumps, blisters and excess coating shall be removed from all bells. The inside of bells shall then be wired brushed and both bells and spigots wiped clean and dry. Stuffing boxes shall be tightened and both hydrant and valve shall be opened and closed to ensure proper operation.

E. After connections are made, the assemblies shall be anchored by tie rods between fittings, or fitting and clamp, and by thrust blocks. Two tie rods shall be installed for each length of connecting pipe. Thrust blocks shall be installed as shown on the drawings.

F. Where fire hydrants are located on areas of high ground water the weep holes shall be plugged.

M. A minimum of seven cubic feet of crushed stone shall be placed under and around the bases of each hydrant to a level of six inches above the waste opening to allow fir drainage ways or sewers.

N. Valves and valve boxes shall be installed as specified for valves.

O. After installation has been completed and checked, backfill shall be placed and thoroughly tamped to the surface at finish grade.

3.13 CONNECTIONS

A. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve unless specified otherwise.

3.14 IDENTIFICATION

A. Install continuous underground warning tape during backfilling of trench for underground water-distribution piping. Locate below finish grade, as specified in Section 312000 "Earth Moving" and as shown on Drawing.

B. Install continuous underground tracer wiring during backfilling of trench for underground nonmetallic piping. Located below finished grade, directly over piping.

C. Valve Marker

1. All gate valves blow off valve and air release valves shall have valve markers installed at 3 to 5 feet offset. Gate valves or air release valves located in pavement or resident lawn shall not have markers.

3.15 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks (if used) have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilized system. Use only potable water.

B. General
   1. The Contractor shall be required to perform leakage tests on newly constructed mains as outlined herein. The Contractor shall furnish the gauges, pump, pipe, connections, and all other necessary apparatus, and shall furnish the necessary assistance to conduct the tests. The Owner or Engineer shall approve the gauges and measuring device used in the tests.
   2. Leakage tests shall be performed on sections of line as indicated in the drawings. Testing shall be conducted as the work progresses unless otherwise directed.
   3. The Contractor may, for his benefit, perform the pressure test and initial leakage test with pipe joints left exposed and pipe sections backfilled one foot over the pipe as specified under the Earthwork Section of this specification. Testing at that time will be permitted, provided that sufficient time is allowed for miscellaneous concrete in the trench to develop adequate strength prior to testing and trenches left open during this period do not constitute a nuisance of hazard to the picnic. However, the pressure and leakage tests required in this specification shall not be performed until final backfill and compaction has been completed.
   4. All testing for record shall be performed in the presence of the owner or their Engineering or his representative.

C. Test Procedures
   1. Where any section of a main is provided with concrete thrust blocking or encasement, hydrostatic testing shall not be performed until at least five days have elapsed after the concrete was installed. If high-early strength cement is used in the concrete for thrust blocks and encasement, the hydrostatic tests shall not be performed until at least one day has elapsed unless otherwise directed by the Owner or their Engineer.
   2. After completion of preparation and after the test connections are made in a manner satisfactory to the Owner or their Engineer, each section of pipe shall be slowly filled with water and pressurized. All pressure shall be based on the elevation of the lowest points in the test section and corrected to the elevation of the test gauge.
   3. All air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all air has been expelled, the corporation cocks shall be closed, and testing begun.

D. Leakage Test
   1. After air has been expelled from a test section, all connections made and other preparations complete, the test section shall be subjected to leakage test pressure. This test pressure shall be sustained by a pump, and the quantity of water delivered to the system by the pump for a specified duration of time shall be measured. At the end of the designated time period, the quality of water delivered to the test section shall be equal to or less than the allowable leakage computed for the test section.
   2. If any test of the pipe disclosed leakage greater than that specified, the Contractor at his own expense shall locate and repair defective joints and/or material until the leakage is within the specified allowance.

3. The Owner shall be furnished a written report of the results of the leakage test that identifies the specific length of pipe tested, the pressure, and the duration of these tests, the amount of actual leakage, and the leakage allowance. The report shall be signed by the Contractor and the Owner or their Engineer.

E. Hydrostatic Test Pressure, Duration and Allowance for Pressure Mains

1. Pressure and leakage test:

a. The design working pressure shall be performed at 100 PSI with the following exceptions:

1) Test pressure shall not exceed pipe or thrust-resistant design pressure.
2) Test pressure shall not cause the working pressure of any valve or other appurtenances to be exceeded.
3) Test pressure shall not exceed 150 psi along the test section.

b. The duration of the acceptable pressure and leakage tests is two hours for potable water mains and thirty minutes for wastewater force mains. The test pressure shall not vary by more than ±5 PSI for the duration of the test.

c. Once the Contractor has filled the water line and air has been expelled, the Contractor shall pump water into the water line until the specified test pressure is met. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe on any valved section thereof to maintain the specified test pressure. Water line pressure shall be maintained within 5 PSI of the specified test pressure during the duration of the test. If the pressure drops below the allowable range, the Contractor shall inject water into the test section until the specified test pressure is reset. The volume of water injected into the test section shall be monitored and recorded in the presence of the Owner and his Engineer or Representative. If the pressure does not drop below the specified range, no water needs to be injected into the test section until the end of the test period. Again, the volume of water injected in the test section to obtain the specified test pressure shall be monitored and recorded in the presence of the Owner or his Engineer or Representative.

d. The allowable leakage for a test section shall be 10.49 gallons per day per mile of pipe per inch of nominal diameter based on a pressure of 150 psi.

e. The allowable leakage is determined by the following formula:

$$L = \frac{SDP^{0.5}}{148{,}000}$$

Where:
L = allowable leakage, in gallons per hour
S = length of pipe testing, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

3.16 DISINFECTION PROCEDURE WHEN CUTTING INTO AN EXISTING MAIN

A. Disinfection of existing water main after a controlled cut-in of tee shall consist of flushing (3ft/sec) to obtain three volumes of water turnover with normal chlorine residual and one set of

bacteriological samples. The existing water main may be returned to service prior to obtaining the bacteriological results.

3.17 DISINFECTION OF NEW WATER MAIN

A. General

1. The Contractor shall disinfect all new water main installed in this work shall be in accordance with AWWA C651. Procedures specified herein for disinfection conform to the Tablet Method, Feed Method, and Slug Method. These methods of disinfection require that all pipes and appurtenances to be kept clean and dry during construction.

B. Tablet Method

1. The tablet method consists of placing calcium hypochlorite granules and tablets in the water main as it is being installed and filling the main with potable water when installation is completed. This method gives an average chlorine dose of approximately 25 mg/l.
2. Placement of calcium hypochlorite granules shall be at the upstream end of the first section of the pipe, at the upstream end of each branch main and at 500 feet intervals. Placement is to be made during construction in accordance with the following Table 1. WARNING: This procedure must not be used on solvent-welded plastic or on screwed joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with calcium hypochlorite.

Table 1
Ounces of Calcium Hypochlorite Granules
To Be places at Beginning of Main
And at Each 500 FT Interval

Pipe Diameter (inches)	Calcium Hypochlorite Granules (ounces)
4	1.7
6	3.8
8	6.7
10	10.5
12	15.1
14 or larger	D^2 x 15.1

Where D is the inside pipe diameter in feet D =d/12

3. Placing of Calcium Hypochlorite tablets: Placement of 5-gram calcium hypochlorite tablets shall be placed in each section of pipe. Also, one such tablet shall be placed in each hydrant branch and other appurtenances. The number of 5 mg tablets required for each pipe section shall be $0.0012d^2L$ rounded to the next higher integer.

d = inside pipe diameter in inches
L = length of pipe section in feet

Table 2 shows the number of tablets required for commonly used size pipes.

Table 2
Number of 5-g Hypochlorite Tablets
Required for Dose of 25 MG/L*

Pipe Diameter (inches)	Length of Pipe Section, Ft.				
	13 or less	18	20	30	40
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13

4. Tablets shall be attached by an adhesive meeting the requirements of NSF/ANSI 61. There shall be adhesive only on the broadside of the tablet attached to the surface of the pipe. All tablets must be attached to the top of the main with each section of pipe having an approximate equal number of tablets. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the pipe exterior to indicate that the pipe has been installed with the tablets at the top.
5. When installation has been completed, the main shall be filled with water at such a rate that water within the main will flow at a velocity no greater than 1 fps. Precautions shall be taken to ensure that air pockets are eliminated. Water will remain in the pipe for at least 24 hours. If the water temperature is less than 41°F (5°C), the water shall remain in the pipe for at least 48 hours. Valves shall be positioned so that the strong chlorine solution in the treatment main will not flow into water main in active service. A detectable free chlorine residual (≥ 0.2 mg/l) shall be found at each sampling point after the 24 -or 48- hour period.

C. Continuous-Feed Method

1. The continuous-feed method consists of completely filling the main with potable water, remove all air pockets, then flushing the completed main to remove particulates, and refilling the main with potable water that has been chlorinated to 25 mg/l. After a 24-hour holding period in the main there shall be a free chlorine residual of not less than 10 mg/l.
2. Preliminary flushing: Before the main is chlorinated, the main shall be filled with potable water to eliminate air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall not be less than 3.0 ft/s unless the Owner's Engineer determines that conditions do not permit the required flow to be discharged to waste. Table 3 shows the rates of flow required to produce a velocity of 3.0 ft/s in pipes of various sizes. Note that flushing is not substitute for preventive measures during construction. Where such flow rates are not possible, flushing at the maximum expected flow rate for the line for 2-3 volumes may be accepted. In mains of 24-inch or larger diameter, an acceptable alternative to flushing is to broom-sweep the main, carefully removing all sweepings prior to filling and chlorinating the main.

Table 3
Required Flow and Opening to Flush Pipelines at 3.0 ft/sec
(40 PSI Residual Pressure in Water Main)

Pipe Diameter (inches)	Flow Required to Produce 3.0 ft/s Velocity in Main	Size of Tap (inches) 1 1.5 2 Number of Taps on Pipe +			Number Hydrant Outlets 2 1/2"	Number Hydrant Outlets 4 /1/2"
4	120	1	---	---	1	1
6	260	---	1	---	1	1
8	470	---	2	1	1	1
10	730	---	3	2	1	1
12	1,060	---	---	2	2	1
16	1,880	---	---	5	2	1

*With a 40-psi pressure in the main with the hydrant flowing to atmosphere, a 2-1/2 in. hydrant outlet will discharge approximately 1,000 gpm and a 4-1/2 in. hydrant outlet with discharge approximately 2,500 gpm.
+ Number of taps on pipe based on 3.0 ft/sec discharge through 5 ft of galvanized iron (GI) pipe with one 90°elbow.

3. Chlorinating the main:
   a. Potable water may be supplied from a temporary backflow-protected connection to the existing distribution system or other supply source approved by the purchaser. The flow shall be at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated using a Pitot gauge in the discharge, measuring the time to fill a container of known volume. Measuring the trajectory of the discharge can be another method. Refer to AWWAS C651-parapgarph 4.4.3 Figure 2 for formula. The main should undergo hydrostatic testing prior to disinfection.
   b. At a point not more than 10 feet downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/l free chlorine. To ensure that an

appropriate concentration is achieved, the free chlorine concentration will be measured at regular time intervals in accordance with the procedures described in **Standard Methods for the examination of water and wastewater or AWWA Manual M12** or using appropriate chlorine test kit. Table 4 gives the amount of chlorine required for each 100 ft. of pipe for various pipe diameters. Solution with a minimum 1 percent chlorine concentration may be prepared with sodium hypochlorite or calcium hypochlorite. The latter solution requires 1 lb. of calcium hypochlorite in 8 gallons of water.

Table 4
Chlorine Required to Produce 25-MG/L Concentration in 100 FT of Pipe-By Diameter

Pipe Diameter (In)	100-Percent Chlorine (LB)	1-Percent Chlorine Solution (GAL)
4	**0.013**	**0.16**
6	**0.030**	**0.36**
8	**0.054**	**0.65**
10	**0.085**	**1.02**
12	**0.120**	**1.44**
14	**0.217**	**2.60**

c. During the application of chlorine, valves shall be positioned so that the strong chlorine solution is the main being treated will not flow into water mains in active service. Chlorine application shall not cease until the entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. At the end of this 24-hour period, the treated water in all portions of the main have a residual of not less than 10 mg/l free chlorine.

d. Direct-feed chlorinators, which operate solely form gas pressure in the chloride cylinder, shall not be used for application of liquid chlorine (gas). (The danger of using direct-free chlorinators is that water pressure in the main can exceed gas pressure in the chlorine cylinder. This allows a backflow of water into the cylinder, resulting in severe cylinder corrosion and escape of chlorine gas.)

The preferred equipment for applying liquid chlorine (gas)is a solution-feed, vacuum-operated chlorinator, and a booster pump. The vacuum-operated chlorinator mixes the chlorine gas in solution water; the booster pump injects the chlorine-gas solution into the main to be disinfected. Hypochlorite solutions may be applied to the water main with a gasoline or electrically powered chemical-free pump designated for feeding chlorine solutions. Feed lines of such material and strengths as to safely withstand the corrosion caused by the concentrated chlorine solution and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main.

Slug Method

1. Slug method consists of completely filling the main to eliminate all air pockets, flushing the main to remove particulates, then slowly flowing through the main a slug of water dosed with chlorine to a concentration of 100 mg/l. The slow flow ensures that all parts of the main and its appurtenances will be exposed to the highly chlorinated water for a period of not less than three hours.
2. Preliminary Flushing: Same paragraph as 3.17 C-2.
3. Chlorinating the main:
    a. Same as paragraph 3.17 C-3
    b. At a point not more than 10 ft downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will not less than 100 mg/l free chlorine. To ensure that this concentration is provided, chlorine concentration should be measured at regular time intervals. The chlorine shall be applied continuously and for a sufficient period to develop a solid column, or slug, of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/l for at least 3 hours.
    c. The free chlorine residual shall be measured in the slug as it moves through the main. If at any time it drops below 50 mg/l, the flow shall be stopped, chlorination equipment shall be relocated at the head of the slug, and as flow is resumed, chlorine shall be applied to restore the free chlorine in the slug to not less than 100 mg/l.
    d. As the chlorinated water flows past fittings and valves, related valves and hydrants shall be operated to disinfect appurtenances and pipes.

3.18 FINAL FLUSHING

A. After the applicable retention period, the heavily chlorinated water shall be flushed from the main fittings, valves, and branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use. The environment to which the chlorinated water is to be discharged shall be inspected. If there is any probability that the chlorinated discharge will cause damage to the environment, neutralizing chemicals shall be applied to the water to be wasted to thoroughly neutralize the residual flows. (See ANSI/AWWA 6.55 for neutralizing chemicals).

3.19 BACTERIOLOGICAL TESTS

A. After final flushing and before the new water main is connected to the distribution system, two bacteriological samples will be collected for each 1,200 feet through the length of the line. The two bacteriological samples must be two consecutive samples 16 hours apart, both with satisfactory bacteriological results. The disinfection procedure must be repeated if there are unsatisfactory bacteriological sample results. Reports on bacteriological tests shall be delivered to the Owner.

3.20 WATER FOR TESTING

A. Water for the work outlined in this section of the specifications shall be provided by the Owner. Sufficient water for three flushing of new pipe without costs. Additional water, when required, shall be provided, and billed to the Contractor at the prevailing rate. The water used for testing purposes shall be taken from an approved potable water source (i.e., a waterworks holding a valid waterworks operation permit).

END OF SECTION 331113

SECTION 334100 STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Manholes.
3. Catch basins.
4. Stormwater inlets.
5. Stormwater detention structures.
6. Pipe outlets.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.
3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and vertical scale of not less than 1 inch equals 5 feet (1:50).

Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

C. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 HP PIPE AND FITTINGS

A. HP Storm Sewer Pipe and Fittings: ADS High-performance polypropylene pipe (per AASHTO) shall have a smooth interior and annular exterior corrugations, with bell-and-spigot joint meeting AASHTO M330, or ASTM F2881. The joint shall be water-tight.
1. Material Properties: Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2881, Section 5 and AASHTO M330, Section 6.1.
2. Joints: Pipe shall be joined using a bell & spigot joint meeting the requirements of ASTM F2881 or AASHTO M330. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. 12- through 60-inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.
3. Fittings: shall conform to ASTM F2881 or AASHTO M330. Bell and spigot connections shall utilize a welded or integral bell and valley or inline gaskets meeting the watertight joint performance requirements of ASTM D3212.

2.2 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.3 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:
1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:
1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:
1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.4 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch (102-mm) minimum thickness, and lengths to provide depth indicated.

6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches (1500 mm).
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.5 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) 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: as indicted on drawing.

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 4 percent.

2.6 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch (102-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
7. Steps: ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches (1500 mm).
8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.7 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy duty, according to utility standards.

2.8 PIPE OUTLETS

A. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."

1. Average Size: NSSGA No. R-3, screen opening 2 inches (51 mm).
2. Average Size: NSSGA No. R-4, screen opening 3 inches (76 mm).
3. Average Size: NSSGA No. R-5, screen opening 5 inches (127 mm).

B. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.

C. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton (2721-kg) average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. 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 gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install 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.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
3. Install HP piping in accordance with ASTM D2321 and ADS recommended installation guidelines.

3.3 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere unless otherwise indicated.

3.4 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.5 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.6 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.7 CONNECTIONS

A. Make connections to existing piping and underground manholes.

1. 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 (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) 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, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

    a. Unshielded flexible couplings for same or minor difference OD pipes.
    b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
    c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.8 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.9 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) 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. Damage: 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.

B. 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 requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    b. Test plastic piping according to ASTM F 1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334100

APPENDIX A: HAZARDOUS MATERIALS INSPECTION REPORT

The Hazardous Materials "Inspection Report", prepared by Ecosystems Environmental Services, Inc. (EESIVA) for the South Hill New Police Station, is dated October 15, 2026 and is provided with the Bidding Documents as a separate PDF attachment. The Hazardous Materials report is for information only and is not part of the Contract Documents.

The opinions expressed in the Hazardous Materials reports are those of the Hazardous Materials Engineer and represent their interpretation of the existing conditions, tests and the results of analyses which they have conducted.

The accuracy or completeness of the data is not warranted or guaranteed by the Owner or the Architect, and in no event is it to be considered part of the Contract Documents. The Owner and Architect expressly disclaim any responsibility for the data as being representative of the conditions and materials which may be encountered.

The data and quantities included in the Hazardous Materials Report shall be used as a basis for the costs required to perform abatement work for this Project. Coordinate with Lump Sum Allowance #5 to cover all costs related to hazardous materials abatement.

The Abatement Subcontractor shall be responsible for a final inspection of existing conditions to verify final locations of hazardous materials prior to commencement of demolition.

Refer to the separate Hazardous Materials Inspection Report PDF file that is included with the Bidding Documents.

Inspection Report

Ecosystems Environmental Services, Inc. (EESIVA)
7480 Lee Davis Road, Suite 8, Mechanicsville, Virginia 23111
Office 804-883-6762 *www.eesiva.com*



Report Name
Lead/asbestos Assessment

Date
Oct 15, 2026

Total # of Observation 44

Project Name
Town of South Hill
111 E Danville Street
South Hill, Virginia

Company Name
EESIVA

Consultant Name
Alexis Bailey
Austin Jackson

Observation #
1

Floor
Ext

Location
A





Observation #
2

Observation
Asbestos containing window glazing.

Location
Side B







Observation #
3

Location
Side D



Observation #
4

Floor

Location
Side C

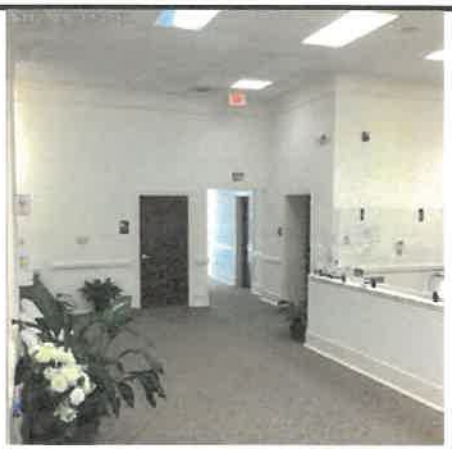




Observation #
5

Floor
1st

Room
Open area



Observation #
6

Floor
1st

Room
Open area



Observation #
11
Floor
2nd
Room
Mechanical





Observation #
12
Floor
2nd
Room
Front left room

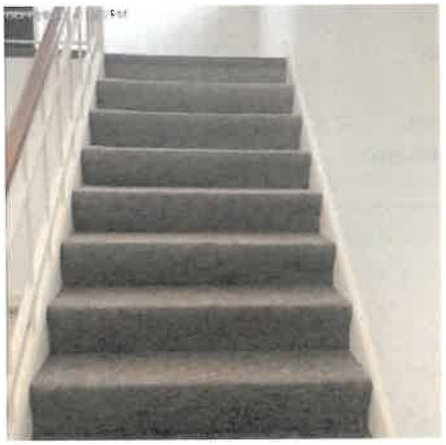




Observation
 # 13

Room
Stairwell

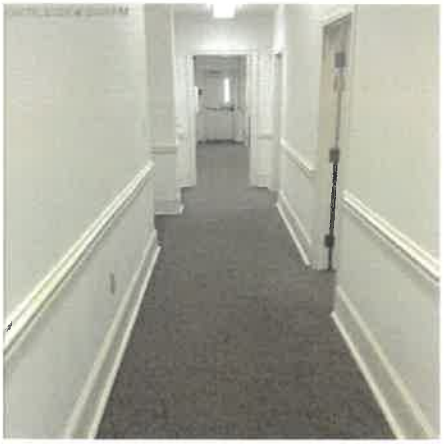




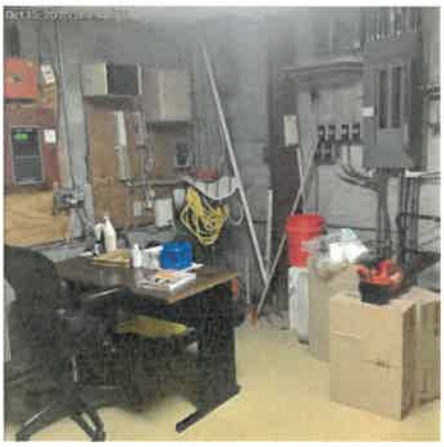
Observation #
14
Floor
1st
Room
Left rear hall
closet



Observation #
15
Floor
1st
Room
Left hallway



Observation #
16
Floor
1st
Room
Maintenance/ mechanical room



Observation #
17
Floor
1st
Room
Men's bathroom 2 (rear men's bathroom)

Observation
Lead-based coating on ceramic tile walls and floor.





Observation #
18
Floor
1st
Room
Women's bathroom 2 (rear women's bathroom)

Observation
Lead-based coating on ceramic tile walls and floor.





Observation #
19
Floor
1st
Room
Rear hall



Observation #
20
Floor
1st
Room
Locked

Observation
Locked



Observation #
21
Floor
1st
Room
Right mechanical room



Observation #
22
Floor
1st
Room
Right hallway



Observation #
23
Floor
1st
Room
Women's bathroom 1



Observation #
24
Floor
1st
Room
Men's bathroom 1



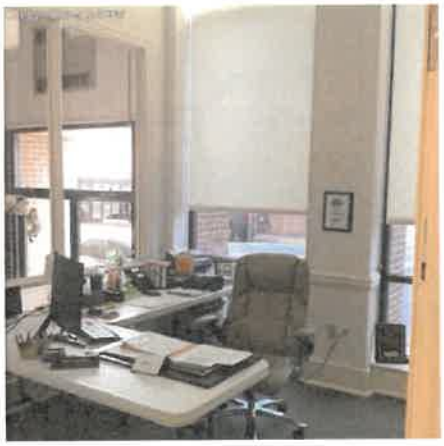
Observation #
25
Floor
1st
Room
Room 9



Observation #
26
Floor
1st
Room
Room 8



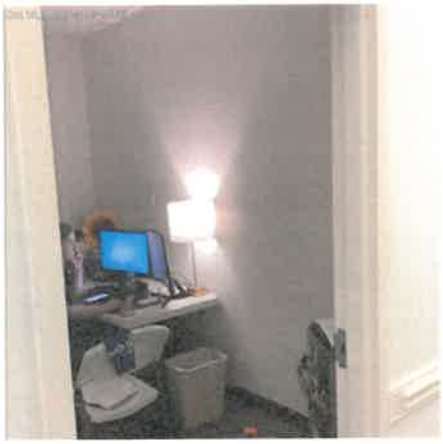
Observation #
27
Floor
1st
Room
Room 7



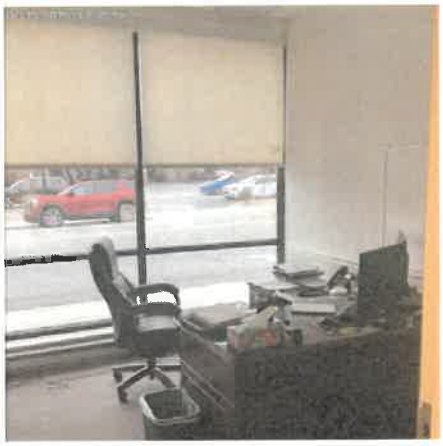
Observation #
28
Floor
1st
Room
Room 6



Observation #
29
Floor
1st
Room
Room 5



Observation #
30
Floor
1st
Room
Room 4 (front left office)



Observation #
31
Floor
1st
Room
Conference room





Observation #
32
Floor
1st
Room
Room 3



Observation #
33
Floor
1st
Room
Locked

Observation
Locked



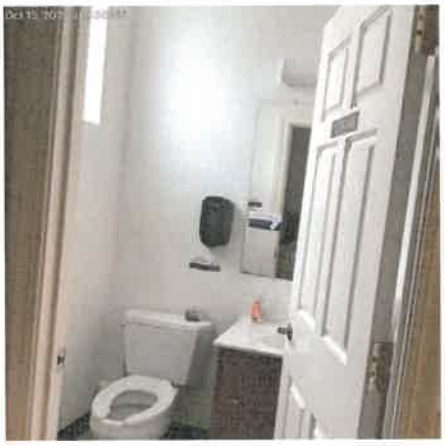
Observation #
34
Floor
1st
Room
Left Vault



Observation #
35
Floor
1st
Room
Room 2 (Vault room)



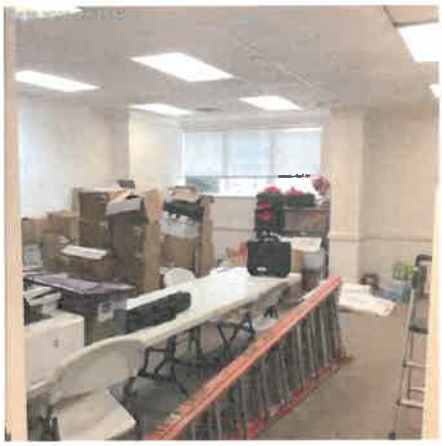
Observation #
36
Floor
1st
Room
Room 1 left
bathroom



Observation #
37
Floor
1st
Room
Room 1 right
bathroom



Observation #
38
Floor
1st
Room
Room 1



Observation #
39
Floor
First
Room
Maintenance/
mechanical room

Observation
Asbestos-containing cove base mastic.





Observation #
40
Floor
First
Room
Vault room

Observation
Asbestos containing vinyl floor tile.









Observation #
41
Floor
First
Room
Left rear hall

Observation
Asbestos containing vinyl floor tile.



Observation #
42

Floor
Second

Room
Mechanical room

Observation
Asbestos containing roof sealant.











Observation #
43

Floor
Second

Observation
Asbestos containing vinyl floor tile below carpet.







Observation #
44

Floor
Second

Observation
Asbestos containing vinyl floor tiles below carpet.





As per your request, Ecosystems Environmental Services, Inc (EESIVA) conducted an asbestos and lead inspection on the interior and exterior of the structure. The site was identified by its characteristic street address. The construction materials in the building were noted.

Ecosystems analyzed painted or coated building components in the interior and exterior as specified by the client for lead-based paint. The analysis was conducted in accordance with the United States Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint in Housing, revised October 1997 for single family housing; the Code of Virginia Lead-Based Paint Activities Regulations Title 54, Chapter 5; and the United States Environmental Protection Agency (EPA) guidelines.

This lead inspection consisted of a visual survey and X-Ray Fluorescence (XRF) analysis of the readily accessible areas of the painted or coated building components tested. The presence or absence of lead-based paint or lead-based paint hazards applies only to tested or assessed surfaces on the date of the field visit and it should be understood that conditions noted within this report were accurate at the time of the inspection and in no way reflect the conditions at the property after the date of the inspection. Conditions of painted surfaces may change due to deterioration, direct damage, or lack of maintenance. Ongoing monitoring by the owner is necessary when lead-based paint is present.

Building components were analyzed for lead content by the SciApps X-550 X-Ray Fluorescence (XRF) Analyzer to measure the lead content of surface coatings on representative homogenous building components. This instrument is non-destructive in obtaining the required results of the painted surfaces tested. The average of six (6) readings was taken with the XRF to verify calibration of equipment according to the manufacturer. A minimum of three calibration checks are conducted prior to testing and three are conducted after testing. Additional calibrations are conducted as per the manufacturer's recommendations. The XRF log for the testing conducted is attached.

Conditions of the painted or coated surfaces were documented, and homogeneous building components were identified. A homogeneous component is a building material that is uniform in color, texture, application, and appears identical in every respect. Room equivalents are identifiable parts of a building (such as a room or a hallway) and are assumed the same if the areas are considered homogeneous. The perimeter walls are identified as A, B, C and D. Side A is the front side. Sides B, C and D are identified clockwise from side A while facing the structure.

The results reported are reflective of the conditions found at the time of the evaluation and not a prediction of any hazards that could occur at a later date. Lead-based paint as defined in the HUD regulation is any lead concentration above 1.0 mg/cm^2 when XRF tested. The lead inspection revealed coated surfaces on the interior of the structure that exceeded the Federal Lead Standard of 1.0 mg/cm^2 and are therefore considered to contain lead-based paint. Building components within the structure that contain lead-based paint are listed in the attached XRF log and are listed below. As per HUD guidelines, when evaluating this report, it is assumed that if one testing combination (i.e. window, door) is positive for lead in an interior room equivalent, that all other similar testing combinations in those areas are assumed to be positive. The same is true for negative readings.

Areas containing lead coatings are as follows:

1. Rear women's and men's bathrooms (women's and men's bathroom 2)
    a. Black and white ceramic wall tile
    b. Black and white ceramic floor tile

Ecosystems collected samples of the suspect asbestos-containing materials that may be impacted by renovations; however, the exterior roof was not sampled as it would potentially cause a roof leak. All work was conducted in accordance with the U.S. Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations contained in 40 CFR Part 61 for Buildings to be Renovated or Demolished.

All accessible areas on the interior and exterior of the building were inspected physically, functional space by functional space and homogeneous area-by-homogeneous area to determine the presence or absence of asbestos-containing materials. No interior demolition was done for sampling purposes. Suspect materials that may be present inside wall cavities, electrical wiring, or materials which were otherwise inaccessible were not included in the scope of findings for this inspection.

Bulk samples were labeled accordingly and transported to an independent laboratory, Hayes Microbial Consulting, LLC (HMC), following standard chain of custody procedures. HMC is licensed as an asbestos laboratory by the Virginia Department of Occupational and Professional Regulation. The relevant credentials for HMC and its analysts are available upon request. Samples were analyzed by Polarized Light Microscopy (PLM), EPA Method 600/R-93/116. The laboratory analysis results, and corresponding chain of custody are attached.

The U.S. Environmental Protection Agency (EPA) defines an asbestos-containing material as one in which the asbestos content is greater than 1%.

Asbestos was detected in the following materials:

a. Cove base mastic – first floor mechanical/maintenance room
b. Vinyl floor tile (tan) – first floor left rear hall
c. Vinyl floor tile (tan) - second floor left rear room
d. Vinyl floor tile (green) – second floor left front room
e. Vinyl floor tile (red/brown) – second floor left front room
f. Vinyl floor tile (grey) – first floor front left office
g. Vinyl floor tile black mastic – first floor front left office
h. Vinyl floor tile (cream) – Vault room
i. Roof sealant – visible in the second-floor mechanical room
j. Exterior window glazing

Note that the vinyl floor tiles listed above were located below carpet. It is suspected that these floor tiles are located throughout the carpeted areas of the structure. The removal of carpet may damage/impact these floor tiles as the carpet was glued to the vinyl floor tile. If additional suspect asbestos containing materials are found during demolition, work must stop until the materials are tested and results are reported.

No asbestos was detected in the remaining samples. Photographs of the asbestos-containing materials are included in the observation section of this report.

These asbestos containing materials are non-friable materials. These materials must not be subject to abrading, sanding, grinding, cutting, pulverizing, or any other forcible action that would potentially release asbestos fibers. The materials must be removed by a Virginia Licensed Asbestos Abatement contractor if they are to be impacted during renovations. All work must be in accordance with all applicable Federal regulations, inclusive of, but not limited to, the U.S. Environmental Protection Agency (EPA) and U.S. Occupational Safety and Health Administration (OSHA).

If you have any questions, please contact us.

Respectfully,

Austin Jackson
Industrial Hygienist
Environmental Professional

Alexis Bailey
Industrial Hygienist
Virginia Asbestos Inspector License #3303004464
Virginia Lead Risk Assessor License #335001186
Vice President/COO

Linda McKoy, RN, CMC, CIEC, CEICC
Occupational Safety and Health Professional
Senior Industrial Hygienist
President/CEO

HAYES
MICROBIAL CONSULTING

#26056427

Analysis Report prepared for

Ecosystems Environmental Services

7480 Lee Davis Rd
Suite 8
Mechanicsville, VA 23111

Phone: **(804) 883-6762**

Town of South Hill
111 E Danville St.
South Hill, Virginia 23970

Collected: **October 15, 2026**
Received: **October 19, 2026**
Reported: **October 20, 2026**

We would like to thank you for trusting Hayes Microbial for your analytical needs!
We received 216 samples by UPS in good condition for this project on October 19th, 2026.

The results in this analysis pertain only to this job, collected on the stated date, and should not be used in the interpretation of any other job. Information supplied by the customer can affect the validity of results. These results apply only to the samples as received. This report may not be duplicated, except in full, without the written consent of Hayes Microbial Consulting, LLC.

All information provided to Hayes Microbial is confidential information relating to our customers and their clients. We will not disclose, copy, or distribute any information verbally or written, except to those designated by the customer(s). We take confidentiality very seriously. No changes to the distribution list will be made without the express consent of the customer.

This laboratory bears no responsibility for sample collection activities, analytical method limitations, or your use of the test results. Interpretation and use of test results are your responsibility. Any reference to health effects or interpretation of mold levels is strictly the opinion of Hayes Microbial. In no event, shall Hayes Microbial or any of its employees be liable for lost profits or any special, incidental or consequential damages arising out of the use of these test results.

Steve Hayes, BSMT(ASCP)
Laboratory Director
Hayes Microbial Consulting, LLC.

EPA Laboratory ID: VA01419

DPH License: #PH-0198

Alexis Bailey
Ecosystems Environmental Services
7480 Lee Davis Rd Suite 8
Mechanicsville, VA 23111
(804) 883-6762

Town of South Hill
111 E Danville St.
South Hill, Virginia 23970

#26056427

Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
1	111-1 - Ceiling Tile (Pin Holes) - 1st Fl Room 1 Side C	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
2	111-2 - Ceiling Tile (Pin Holes) - 1st Fl Room 1 Side C	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
3	111-3 - Ceiling Tile (Pin Holes) - 1st Fl Room 1 Side C	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
4	111-4 - Ceiling Tile (Long Lines) - 1st Fl Room 1 Side C	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
5	111-5 - Ceiling Tile (Long Lines) - 1st Fl Room 1 Side C	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
6	111-6 - Ceiling Tile (Long Lines) - 1st Fl Room 1 Side C	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
7	111-7 - Ceiling Tile - Mechanical Room Side D	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
8	111-8 - Ceiling Tile - Mechanical Room Side D	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
9	111-9 - Ceiling Tile - Mechanical Room Side D	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
10	111-10 - Plaster (2nd Layer) - Mens Bathroom Wall D	Heterogenous / Rough Coat / Gray	100%		**None Detected**
11	111-11 - Plaster (2nd Layer) - Mens Bathroom Wall D	Heterogenous / Rough Coat / Gray	100%		**None Detected**

Collected: **Oct 15, 2026** Received: **Oct 19, 2026** Reported: **Oct 20, 2026**

HAYES MICROBIAL CONSULTING

Project Analyst: Megan Audia, Megan Audia Date: **10 - 19 - 2026**

Reviewed By: Brian Keith, Date: **10 - 20 - 2026**

Alexis Bailey
Ecosystems Environmental Services
7480 Lee Davis Rd Suite 8
Mechanicsville, VA 23111
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Town of South Hill
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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
12	111-12 - Plaster (2nd Layer) - Mens Bathroom Wall D	Heterogenous / Rough Coat / Gray	100%		None Detected
13	111-13 - White Ceramic Floor Tile - Mens Bathroom Side D	Heterogenous / Ceramic Tile / White	100%		None Detected
14	111-14 - White Ceramic Floor Tile - Mens Bathroom Side D	Heterogenous / Ceramic Tile / White	100%		None Detected
15	111-15 - White Ceramic Floor Tile - Mens Bathroom Side D	Heterogenous / Ceramic Tile / White	100%		None Detected
16	111-16 - White Ceramic Wall Tile - Mens Bathroom Side D	Heterogenous / Ceramic Tile / White	100%		None Detected
17	111-17 - White Ceramic Wall Tile - Mens Bathroom Side D	Heterogenous / Ceramic Tile / White	100%		None Detected
18	111-18 - White Ceramic Wall Tile - Mens Bathroom Side D	Heterogenous / Ceramic Tile / White	100%		None Detected
19	111-19 - Brown Wall Material (Bottom Layer) - 1st Fl Mens Bathroom 2	Heterogenous / Rough Coat / Gray	100%		None Detected
20	111-20 - Brown Wall Material (Bottom Layer) - 1st Fl Mens Bathroom 2	Heterogenous / Rough Coat / Gray	100%		None Detected
21	111-21 - Brown Wall Material (Bottom Layer) - 1st Fl Mens Bathroom 2	Heterogenous / Rough Coat / Gray	100%		None Detected
22	111-22 - Cove Base Mastic - 1st Fl Rear Hall Side C	Homogenous / Adhesive / Brown	100%		None Detected

Alexis Bailey
Ecosystems Environmental Services
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EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
23	111-23 - Cove Base Mastic - 1st Fl Rear Hall Side C	Homogenous / Adhesive / Brown	100%		**None Detected**
24	111-24 - Cove Base Mastic - 1st Fl Rear Hall Side C	Homogenous / Adhesive / Brown	100%		**None Detected**
25	111-25 - Door Caulk - 1st Fl Hallway Side C	Homogenous / Caulk / White	100%		**None Detected**
26	111-26 - Door Caulk - 1st Fl Hallway Side C	Homogenous / Caulk / White	100%		**None Detected**
27	111-27 - Door Caulk - 1st Fl Hallway Side C	Homogenous / Caulk / White	100%		**None Detected**
28	111-28 - Wallpaper - 1st Fl Rear Hall Side C	Heterogenous / Wallpaper / Tan	15%	85% Cellulose Fibers	**None Detected**
29	111-29 - Wallpaper - 1st Fl Rear Hall Side C	Heterogenous / Wallpaper / Tan	15%	85% Cellulose Fibers	**None Detected**
30	111-30 - Wallpaper - 1st Fl Rear Hall Side C	Heterogenous / Wallpaper / Tan	15%	85% Cellulose Fibers	**None Detected**
31	111-31 - Mastic - 1st Fl Rear Hall Side C	Homogenous / Adhesive / Tan	100%		**None Detected**
32	111-32 - Mastic - 1st Fl Rear Hall Side C	Homogenous / Adhesive / Tan	100%		**None Detected**
33	111-33 - Mastic - 1st Fl Rear Hall Side C	Homogenous / Adhesive / Tan	100%		**None Detected**

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EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
34	111-34 - Vinyl Floor Tile - 1st Fl Rear Hallway Side C	Heterogenous / Vinyl Tile / Brown	100%		None Detected
35	111-35 - Vinyl Floor Tile - 1st Fl Rear Hallway Side C	Heterogenous / Vinyl Tile / Brown	100%		None Detected
36	111-36 - Vinyl Floor Tile - 1st Fl Rear Hallway Side C	Heterogenous / Vinyl Tile / Brown	100%		None Detected
37	111-37 - Cove Base Mastic - 1st Fl Mechanical Room Side D	Homogenous / Adhesive / Brown	97%		3% Chrysotile
38	111-38 - Cove Base Mastic - 1st Fl Mechanical Room Side D	Homogenous / Adhesive / Brown	97%		3% Chrysotile
39	111-39 - Cove Base Mastic - 1st Fl Mechanical Room Side D	Homogenous / Adhesive / Brown	97%		3% Chrysotile
40	111-40 - Vinyl Floor Tile - 1 Fl Left Rear Hall	Homogenous / Floor Tile / Tan	94%		6% Chrysotile
41	111-41 - Vinyl Floor Tile - 1 Fl Left Rear Hall	Homogenous / Floor Tile / Tan	94%		6% Chrysotile
42	111-42 - Vinyl Floor Tile - 1 Fl Left Rear Hall	Homogenous / Floor Tile / Tan	94%		6% Chrysotile
43	111-40A - Top Layer Mastic - 1st Fl Left Rear Hall	Homogenous / Adhesive / Yellow	100%		None Detected
44	111-41A - Top Layer Mastic - 1st Fl Left Rear Hall	Homogenous / Adhesive / Yellow	100%		None Detected

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Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
45	111-42A - Top Layer Mastic - 1st Fl Left Rear Hall	Homogenous / Adhesive / Yellow	100%		None Detected
46	111-40B - Bottom Layer Mastic - 1 Fl Left Rear Hall	Homogenous / Mastic / Black	100%		None Detected
47	111-41B - Bottom Layer Mastic - 1 Fl Left Rear Hall	Homogenous / Mastic / Black	100%		None Detected
48	111-42B - Bottom Layer Mastic - 1 Fl Left Rear Hall	Homogenous / Mastic / Brown	100%		None Detected
49	111-43 - Black Ceramic Wall Tile - 1st Fl Mens Bathroom 2	Heterogenous / Ceramic Tile / Black	100%		None Detected
50	111-44 - Black Ceramic Wall Tile - 1st Fl Mens Bathroom 2	Heterogenous / Ceramic Tile / Black	100%		None Detected
51	111-45 - Black Ceramic Wall Tile - 1st Fl Mens Bathroom 2	Heterogenous / Ceramic Tile / Black	100%		None Detected
52	111-46 - Black Ceramic Floor Tile - 1st Fl Mens Bathroom 2	Heterogenous / Ceramic Tile / White	100%		None Detected
53	111-47 - Black Ceramic Floor Tile - 1st Fl Mens Bathroom 2	Heterogenous / Ceramic Tile / White	100%		None Detected
54	111-48 - Black Ceramic Floor Tile - 1st Fl Mens Bathroom 2	Heterogenous / Ceramic Tile / White	100%		None Detected
55	111-49 - Vinyl Floor Tile - 2nd Fl Left Rear Room (Below Carpet)	Homogenous / Floor Tile / Tan	94%		6% Chrysotile

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#26056427

Asbestos PLM Bulk

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
56	111-50 - Vinyl Floor Tile - 2nd Fl Left Rear Room (Below Carpet)	Homogenous / Floor Tile / Tan	94%		6% Chrysotile
57	111-51 - Vinyl Floor Tile - 2nd Fl Left Rear Room (Below Carpet)	Homogenous / Floor Tile / Tan	94%		6% Chrysotile
58	111-52 - Mastic - 2nd Fl Left Rear Room (Below Carpet)	Homogenous / Mastic / Black	100%		None Detected
59	111-53 - Mastic - 2nd Fl Left Rear Room (Below Carpet)	Homogenous / Mastic / Black	100%		None Detected
60	111-54 - Mastic - 2nd Fl Left Rear Room (Below Carpet)	Homogenous / Mastic / Black	100%		None Detected
61	111-55 - Green Vinyl Floor Tile - 2nd Fl Front Left Room	Homogenous / Floor Tile / Green	94%		6% Chrysotile
62	111-56 - Green Vinyl Floor Tile - 2nd Fl Front Left Room	Homogenous / Floor Tile / Green	94%		6% Chrysotile
63	111-57 - Green Vinyl Floor Tile - 2nd Fl Front Left Room	Homogenous / Floor Tile / Green	94%		6% Chrysotile
64	111-58 - Mastic - 2nd Fl Front Left Room	Homogenous / Mastic / Black	100%		None Detected
65	111-59 - Mastic - 2nd Fl Front Left Room	Homogenous / Mastic / Black	100%		None Detected
66	111-60 - Mastic - 2nd Fl Front Left Room	Homogenous / Mastic / Black	100%		None Detected

Alexis Bailey
Ecosystems Environmental Services
7480 Lee Davis Rd Suite 8
Mechanicsville, VA 23111
(804) 883-6762

Town of South Hill
111 E Danville St.
South Hill, Virginia 23970

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
67	111-61 - Floor Caulk - 2nd Fl Left Front Room	Homogenous / Caulk / Beige	100%		**None Detected**
68	111-62 - Floor Caulk - 2nd Fl Front Left Room	Homogenous / Caulk / Beige	100%		**None Detected**
69	111-63 - Floor Caulk - 2nd Fl Front Left Room	Homogenous / Caulk / Beige	100%		**None Detected**
70	111-64 - Vinyl Sheet Floor - 2nd Fl Left Front Room	Heterogenous / Vinyl Tile / Gray	100%		**None Detected**
71	111-65 - Vinyl Sheet Floor - 2nd Fl Left Front Room	Heterogenous / Vinyl Tile / Gray	100%		**None Detected**
72	111-66 - Vinyl Sheet Floor - 2nd Fl Left Front Room	Heterogenous / Vinyl Tile / Gray	100%		**None Detected**
73	111-67 - Mastic - 2nd Fl Left Front Room	Homogenous / Adhesive / Yellow	100%		**None Detected**
74	111-68 - Mastic - 2nd Fl Left Front Room	Homogenous / Adhesive / Yellow	100%		**None Detected**
75	111-69 - Mastic - 2nd Fl Left Front Room	Homogenous / Adhesive / Yellow	100%		**None Detected**
76	111-70 - Grey Floor Material - 2nd Fl Left Front Room	Heterogenous / Cementitious / Gray	100%		**None Detected**
77	111-71 - Grey Floor Material - 2nd Fl Left Front Room	Heterogenous / Cementitious / Gray	100%		**None Detected**

Alexis Bailey
Ecosystems Environmental Services
7480 Lee Davis Rd Suite 8
Mechanicsville, VA 23111
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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
78	111-72 - Grey Floor Material - 2nd Fl Left Front Room	Heterogenous / Cementitious / Gray	100%		None Detected
79	111-73 - Mastic - 2nd Fl Left Front Room	Homogenous / Mastic / Black	100%		None Detected
80	111-74 - Mastic - 2nd Fl Left Front Room	Homogenous / Mastic / Black	100%		None Detected
81	111-75 - Mastic - 2nd Fl Left Front Room	Homogenous / Mastic / Black	100%		None Detected
82	111-76 - Red Vinyl Floor Tile - 2nd Fl Left Front Room	Homogenous / Floor Tile / Brown	94%		6% Chrysotile
83	111-77 - Red Vinyl Floor Tile - 2nd Fl Left Front Room	Homogenous / Floor Tile / Brown	94%		6% Chrysotile
84	111-78 - Red Vinyl Floor Tile - 2nd Fl Left Front Room	Homogenous / Floor Tile / Brown	94%		6% Chrysotile
85	111-79 - Mastic - 2nd Fl Left Front Room	Homogenous / Mastic / Black	100%		None Detected
86	111-80 - Mastic - 2nd Fl Left Front Room	Homogenous / Mastic / Black	100%		None Detected
87	111-81 - Mastic - 2nd Fl Left Front Room	Homogenous / Mastic / Black	100%		None Detected
88	111-82 - Plaster Brown Coat - 2nd Fl Left Front Room	Heterogenous / Rough Coat / Gray	100%		None Detected

Collected: **Oct 15, 2026** Received: **Oct 19, 2026** Reported: **Oct 20, 2026**

HAYES MICROBIAL CONSULTING

Project Analyst: Megan Audia, *Megan Audia* Date: **10 - 19 - 2026**

Reviewed By: Brian Keith, Date: **10 - 20 - 2026**

3005 East Boundary Terrace, Suite F. Midlothian, VA. 23112 (804) 562-3435 contact@hayesmicrobial.com

Alexis Bailey
Ecosystems Environmental Services
7480 Lee Davis Rd Suite 8
Mechanicsville, VA 23111
(804) 883-6762

Town of South Hill
111 E Danville St.
South Hill, Virginia 23970

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
89	111-83 - Plaster Brown Coat - 2nd Fl Left Front Room	Heterogenous / Rough Coat / Gray	100%		None Detected
90	111-84 - Plaster Brown Coat - 2nd Fl Left Front Room	Heterogenous / Rough Coat / Gray	100%		None Detected
91	111-85 - Light Grey Plaster Material - 2nd Fl Mechanical Room	Heterogenous / Rough Coat / Gray	100%		None Detected
92	111-86 - Light Grey Plaster Material - 2nd Fl Mechanical Room	Heterogenous / Rough Coat / Gray	100%		None Detected
93	111-87 - Light Grey Plaster Material - 2nd Fl Mechanical Room	Heterogenous / Rough Coat / Gray	100%		None Detected
94	111-88 - Block Mortar - 2nd Fl Mechanical Room	Heterogenous / Mortar / Gray	100%		None Detected
95	111-89 - Block Mortar - 2nd Fl Mechanical Room	Heterogenous / Mortar / Gray	100%		None Detected
96	111-90 - Block Mortar - 2nd Fl Mechanical Room	Heterogenous / Mortar / Gray	100%		None Detected
97	111-91 - Block - 2nd Fl Mechanical Room	Heterogenous / Cementitious / Gray	100%		None Detected
98	111-92 - Block - 2nd Fl Mechanical Room	Heterogenous / Cementitious / Gray	100%		None Detected
99	111-93 - Block - 2nd Fl Mechanical Room	Heterogenous / Cementitious / Gray	100%		None Detected

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
100	111-94 - Plaster Brown Coat - 2nd Fl Mechanical Room	Heterogenous / Rough Coat / Gray	100%		None Detected
101	111-95 - Plaster Brown Coat - 2nd Fl Mechanical Room	Heterogenous / Rough Coat / Gray	100%		None Detected
102	111-96 - Plaster Brown Coat - 2nd Fl Mechanical Room	Heterogenous / Rough Coat / Gray	100%		None Detected
103	111-97 - Carpet - 2nd Fl Front Left Room	Homogenous / Carpet Foam Remnants / Gray	100%		None Detected
104	111-98 - Carpet - 2nd Fl Front Left Room	Homogenous / Carpet Foam Remnants / Gray	100%		None Detected
105	111-99 - Carpet - 2nd Fl Front Left Room	Homogenous / Carpet Foam Remnants / Gray	100%		None Detected
106	111-97A - Mastic - 2nd Fl Front Left Room	Homogenous / Adhesive / Yellow	100%		None Detected
107	111-98A - Mastic - 2nd Fl Front Left Room	Homogenous / Adhesive / Yellow	100%		None Detected
108	111-99A - Mastic - 2nd Fl Front Left Room	Homogenous / Adhesive / Yellow	100%		None Detected
109	111-100 - Brick Mortar - 2nd Fl Mechanical Room	Heterogenous / Mortar / Gray	100%		None Detected
110	111-101 - Brick Mortar - 2nd Fl Mechanical Room	Heterogenous / Mortar / Gray	100%		None Detected

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
111	111-102 - Brick Mortar - 2nd Fl Mechanical Room	Heterogenous / Mortar / Gray	100%		**None Detected**
112	111-103 - Brick - 2nd Fl Mechanical Room	Homogenous / Brick / Red	100%		**None Detected**
113	111-104 - Brick - 2nd Fl Mechanical Room	Homogenous / Brick / Red	100%		**None Detected**
114	111-105 - Brick - 2nd Fl Mechanical Room	Homogenous / Brick / Red	100%		**None Detected**
115	111-106 - Plaster Skim Coat - 2nd Fl Left Front Room	Homogenous / Skim Coat / White	100%		**None Detected**
116	111-107 - Plaster Skim Coat - 2nd Fl Left Front Room	Homogenous / Skim Coat / White	100%		**None Detected**
117	111-108 - Plaster Skim Coat - 2nd Fl Left Front Room	Homogenous / Skim Coat / White	100%		**None Detected**
118	111-109 - Ceiling Tile (Divits) - 2nd Fl Front Left Room	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
119	111-110 - Ceiling Tile (Divits) - 2nd Fl Front Left Room	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
120	111-111 - Ceiling Tile (Divits) - 2nd Fl Front Left Room	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**
121	111-112 - Ceiling Tile (Long Lines) - 2nd Fl Front Left Room	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	**None Detected**

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7480 Lee Davis Rd Suite 8
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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
122	111-113 - Ceiling Tile (Long Lines) - 2nd Fl Front Left Room	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	None Detected
123	111-114 - Ceiling Tile (Long Lines) - 2nd Fl Front Left Room	Heterogenous / Ceiling Tile / White/Brown	20%	65% Cellulose Fibers 15% Mineral/Glass wool	None Detected
124	111-115 - Cabinet Caulk - 2nd Fl Front Left Room	Homogenous / Caulk / Black	100%		None Detected
125	111-116 - Cabinet Caulk - 2nd Fl Front Left Room	Homogenous / Caulk / Black	100%		None Detected
126	111-117 - Cabinet Caulk - 2nd Fl Front Left Room	Homogenous / Caulk / Black	100%		None Detected
127	111-118 - Cove Base (Black) Mastic - 2nd Fl Left Front Room	Homogenous / Adhesive / Yellow	100%		None Detected
128	111-119 - Cove Base (Black) Mastic - 2nd Fl Left Front Room	Homogenous / Adhesive / Yellow	100%		None Detected
129	111-120 - Cove Base (Black) Mastic - 2nd Fl Left Front Room	Homogenous / Adhesive / Yellow	100%		None Detected
130	111-121 - Roof Sealant - 2nd Fl Mechanical Room	Homogenous / Sealant / Black	96%		4% Chrysotile
131	111-122 - Roof Sealant - 2nd Fl Mechanical Room	Homogenous / Sealant / Black	96%		4% Chrysotile
132	111-123 - Roof Sealant - 2nd Fl Mechanical Room	Homogenous / Sealant / Black	96%		4% Chrysotile

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
133	111-124 - Carpet Mastic - Front Left Office Adj. Conference Room	Homogenous / Adhesive / Yellow	100%		**None Detected**
134	111-125 - Carpet Mastic - Front Left Office Adj. Conference Room	Homogenous / Adhesive / Yellow	100%		**None Detected**
135	111-126 - Carpet Mastic - Front Left Office Adj. Conference Room	Homogenous / Adhesive / Yellow	100%		**None Detected**
136	111-127 - Wallpaper - 2nd Fl Left Front Room	Heterogenous / Wallpaper / Tan	5%	95% Cellulose Fibers	**None Detected**
137	111-128 - Wallpaper - 2nd Fl Left Front Room	Heterogenous / Wallpaper / Tan	5%	95% Cellulose Fibers	**None Detected**
138	111-129 - Wallpaper - 2nd Fl Left Front Room	Heterogenous / Wallpaper / Tan	5%	95% Cellulose Fibers	**None Detected**
139	111-130 - Wall Surfacing Material (On Wallpaper) 2nd Fl Left Front Room	Homogenous / Joint Compound / White	100%		**None Detected**
140	111-131 - Wall Surfacing Material (On Wallpaper) 2nd Fl Left Front Room	Homogenous / Joint Compound / White	100%		**None Detected**
141	111-132 - Wall Surfacing Material (On Wallpaper) 2nd Fl Left Front Room	Homogenous / Joint Compound / White	100%		**None Detected**
142	111-133 - Wall Surfacing - 2nd Fl Left Front Room	Homogenous / Joint Compound / White	100%		**None Detected**
143	111-134 - Wall Surfacing - 2nd Fl Left Front Room	Homogenous / Joint Compound / White	100%		**None Detected**

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
144	111-135 - Wall Surfacing - 2nd Fl Left Front Room	Homogenous / Joint Compound / White	100%		None Detected
145	111-136 - Grey Window Caulk - Exterior Side C	Homogenous / Caulk / Black	100%		None Detected
146	111-137 - Grey Window Caulk - Exterior Side C	Homogenous / Caulk / Black	100%		None Detected
147	111-138 - Grey Window Caulk - Exterior Side C	Homogenous / Caulk / Black	100%		None Detected
148	111-139 - Black Window Caulk - Exterior Side C	Homogenous / Caulk / Black	100%		None Detected
149	111-140 - Black Window Caulk - Exterior Side C	Homogenous / Caulk / Black	100%		None Detected
150	111-141 - Black Window Caulk - Exterior Side C	Homogenous / Caulk / Black	100%		None Detected
151	111-142 - Lintel Caulk - Exterior Rear	Homogenous / Caulk / White	100%		None Detected
152	111-143 - Lintel Caulk - Exterior Rear	Homogenous / Caulk / White	100%		None Detected
153	111-144 - Lintel Caulk - Exterior Rear	Homogenous / Caulk / White	100%		None Detected
154	111-145 - Window Frame Caulk - Exterior Rear	Homogenous / Caulk / Gray	100%		None Detected

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Ecosystems Environmental Services
7480 Lee Davis Rd Suite 8
Mechanicsville, VA 23111
(804) 883-6762

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
155	111-146 - Window Frame Caulk - Exterior Rear	Homogenous / Caulk / Gray	100%		None Detected
156	111-147 - Window Frame Caulk - Exterior Rear	Homogenous / Caulk / Gray	100%		None Detected
157	111-148 - Window Frame Caulk - Exterior Side B	Homogenous / Caulk / Black	96%		4% Chrysotile
158	111-149 - Window Frame Caulk - Exterior Side B	Homogenous / Caulk / Black	96%		4% Chrysotile
159	111-150 - Window Frame Caulk - Exterior Side B	Homogenous / Caulk / Black	96%		4% Chrysotile
160	111-151 - Window Caulk - Exterior Side B	Homogenous / Caulk / Brown	100%		None Detected
161	111-152 - Window Caulk - Exterior Side B	Homogenous / Caulk / Brown	100%		None Detected
162	111-153 - Window Caulk - Exterior Side B	Homogenous / Caulk / Brown	100%		None Detected
163	111-154 - Window Caulk - Exterior Rear	Homogenous / Caulk / Gray	100%		None Detected
164	111-155 - Window Caulk - Exterior Rear	Homogenous / Caulk / Gray	100%		None Detected
165	111-156 - Window Caulk - Exterior Rear	Homogenous / Caulk / Gray	100%		None Detected

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
166	111-157 - Wall Caulk - Left to F Exterior Door Side C	Homogenous / Caulk / Black	100%		None Detected
167	111-158 - Wall Caulk - Left to F Exterior Door Side C	Homogenous / Caulk / Black	100%		None Detected
168	111-159 - Wall Caulk - Left to F Exterior Door Side C	Homogenous / Caulk / Black	100%		None Detected
169	111-160 - Wall Surfacing Material - Mechanical Room Wall C	Homogenous / Texture / White	100%		None Detected
170	111-161 - Wall Surfacing Material - Mechanical Room Wall C	Homogenous / Texture / White	100%		None Detected
171	111-162 - Wall Surfacing Material - Mechanical Room Wall C	Homogenous / Texture / White	100%		None Detected
172	111-163 - Joint Compound	Homogenous / Joint Compound / White	100%		None Detected
173	111-164 - Joint Compound	Homogenous / Joint Compound / White	100%		None Detected
174	111-165 - Joint Compound	Homogenous / Joint Compound / White	100%		None Detected
175	111-166 - Drywall	Heterogenous / Drywall / Gray	95%	5% Cellulose Fibers	None Detected
176	111-167 - Drywall	Heterogenous / Drywall / Gray	95%	5% Cellulose Fibers	None Detected

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
177	111-168 - Drywall	Heterogenous / Drywall / Gray	95%	5% Cellulose Fibers	**None Detected**
178	111-169 - Vinyl Floor - Room 1 Left Bathroom	Homogenous / Vinyl Tile / Beige	100%		**None Detected**
179	111-170 - Vinyl Floor - Room 1 Left Bathroom	Homogenous / Vinyl Tile / Beige	100%		**None Detected**
180	111-171 - Vinyl Floor - Room 1 Left Bathroom	Homogenous / Vinyl Tile / Beige	100%		**None Detected**
181	111-172 - Mastic - Room 1 Left Bathroom	Homogenous / Mastic / Yellow	100%		**None Detected**
182	111-173 - Mastic - Room 1 Left Bathroom	Homogenous / Mastic / Yellow	100%		**None Detected**
183	111-174 - Mastic - Room 1 Left Bathroom	Homogenous / Mastic / Yellow	100%		**None Detected**
184	111-178 - Wallpaper - Room 1 Left Bathroom	Homogenous / Wallpaper / White	1%	99% Cellulose Fibers	**None Detected**
185	111-179 - Wallpaper - Room 1 Left Bathroom	Homogenous / Wallpaper / White	1%	99% Cellulose Fibers	**None Detected**
186	111-180 - Wallpaper - Room 1 Left Bathroom	Homogenous / Wallpaper / White	1%	99% Cellulose Fibers	**None Detected**
187	111-181 - Wallpaper Caulk - Room 1 Left Bathroom	Homogenous / Caulk / White	100%		**None Detected**

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
188	111-182 - Wallpaper Caulk - Room 1 Left Bathroom	Homogenous / Caulk / White	100%		None Detected
189	111-183 - Wallpaper Caulk - Room 1 Left Bathroom	Homogenous / Caulk / White	100%		None Detected
190	111-184 - Vinyl Floor Tile - Front Left Office	Homogenous / Floor Tile / Gray	97%		3% Chrysotile
191	111-185 - Vinyl Floor Tile - Front Left Office	Homogenous / Floor Tile / Gray	97%		3% Chrysotile
192	111-186 - Vinyl Floor Tile - Front Left Office	Homogenous / Floor Tile / Gray	97%		3% Chrysotile
193	111-187 - Mastic (Top Layer) - Front Left Office	Homogenous / Mastic / Yellow	100%		None Detected
194	111-188 - Mastic (Top Layer) - Front Left Office	Homogenous / Mastic / Yellow	100%		None Detected
195	111-189 - Mastic (Top Layer) - Front Left Office	Homogenous / Mastic / Yellow	100%		None Detected
196	111-190 - Mastic (Bottom Layer) - Front Left Office	Homogenous / Mastic / Black	94%		6% Chrysotile
197	111-191 - Mastic (Bottom Layer) - Front Left Office	Homogenous / Mastic / Black	94%		6% Chrysotile
198	111-192 - Mastic (Bottom Layer) - Front Left Office	Homogenous / Mastic / Black	94%		6% Chrysotile

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
199	111-193 - Roof Sealant (On Top of Roof)	Heterogenous / Sealant / Gray	85%	15% Wood Fibers	None Detected
200	111-194 - Roof Sealant (On Top of Roof)	Heterogenous / Sealant / Gray	85%	15% Wood Fibers	None Detected
201	111-195 - Roof Sealant (On Top of Roof)	Heterogenous / Sealant / Gray	85%	15% Wood Fibers	None Detected
202	111-196 - Wall Mastic - Vault Room	Homogenous / Mastic / Tan	100%		None Detected
203	111-197 - Wall Mastic - Vault Room	Homogenous / Mastic / Tan	100%		None Detected
204	111-198 - Wall Mastic - Vault Room	Homogenous / Mastic / Tan	100%		None Detected
205	111-199 - Vinyl Floor Tile - Vault Room	Homogenous / Floor Tile / Cream	98%		2% Chrysotile
206	111-200 - Vinyl Floor Tile - Vault Room	Homogenous / Floor Tile / Cream	98%		2% Chrysotile
207	111-201 - Vinyl Floor Tile - Vault Room	Homogenous / Floor Tile / Cream	98%		2% Chrysotile
208	111-202 - Mastic - Vault Room	Homogenous / Mastic / Black	100%		None Detected
209	111-203 - Mastic - Vault Room	Homogenous / Mastic / Black	100%		None Detected

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#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
210	111-204 - Mastic - Vault Room	Homogenous / Mastic / Black	100%		None Detected
211	111-205 - Carpet Mastic - Vault Room	Homogenous / Mastic / Yellow	100%		None Detected
212	111-206 - Carpet Mastic - Vault Room	Homogenous / Mastic / Yellow	100%		None Detected
213	111-207 - Carpet Mastic - Vault Room	Homogenous / Mastic / Yellow	100%		None Detected
214	111-208 - Wallpaper - Mechanical Room	Homogenous / Wallpaper / Brown	1%	99% Cellulose Fibers	None Detected
215	111-209 - Wallpaper - Mechanical Room	Homogenous / Wallpaper / Brown	1%	99% Cellulose Fibers	None Detected
216	111-210 - Wallpaper - Mechanical Room	Homogenous / Wallppaer / Brown	1%	99% Cellulose Fibers	None Detected

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Mechanicsville, VA 23111
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Asbestos Analysis Information

Analysis Details	All samples were received in acceptable condition unless otherwise noted on the report. This report must not be used by the client to claim product certification, approval, or endorsement by AIHA, NIST, NVLAP, NY ELAP, or any agency. The results relate only to the items tested. Hayes Microbial Consulting reserves the right to dispose of all samples after a period of 60 days in compliance with state and federal guidelines.
PLM Analysis	All Polarized Light Microscopy (PLM) results include an inherent uncertainty of measurement associated with estimating percentages by PLM. Materials with interfering matrix, low asbestos content, or small fiber size may require additional analysis via TEM Analysis.
TEM Analysis	Analysis by TEM is capable of providing positive identification of asbestos type(s) and semi-quantitation of asbestos content.
Definitions	'None Detected' - Below the detected reporting limit of 1% unless point counting is performed, then the detected reporting limit is .25%.
New York ELAP	Per NY ELAP198.6 (NOB), TEM is the only reliable method to declare an NOB material as Non-Asbestos Containing. Any NY ELAP samples that are subcontracted to another laboratory will display the name and ELAP Lab Identification number in the report page heading of those samples. The original report provided to Hayes Microbial Consulting is available upon request.

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SHIP: UPS - SD
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ASBESTOS

26056427

Job Number:	Job Name: Town of South Hill 111 E Danville St, South Hill, Virginia 23970
Collector: Alexis Bailey & Austin Jackson	Mobile: 804-883-6762 Email: info@eesiva.com
Date Collected: 10/15/26	Note:

Analysis Type		Analysis Methods	Turnaround Times					
PLM	Bulk	EPA 600*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Point Count	400 Point*, 1000 Point*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Vermiculite	EPA 600*, Cincinnati Method	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Soil	EPA 600*, CARB 435	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
TEM	Air	EPA AHERA, NIOSH 7402		Same Day	1 Day	2 Day	3 Day	5 Day
	Bulk	Chatfield	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Wipe	ASTM D6480-05	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Microvac	ASTM D5755-09	-	Same Day	1 Day	2 Day	3 Day	5 Day
PCM	Air	NIOSH 7400	3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-1	Ceiling tile (pin holes) - 1st fl room 1 side C	Bulk	24hr		
2		111-2					
3		111-3					
4		111-4	Ceiling tile (long lines) -				
5		111-5					
6		111-6					
7		111-7	Ceiling tile - mechanical room side D				
8		111-8					
9		111-9					
10		111-10	Plaster (2nd layer) - mens bathroom wall D				
11		111-11					
12		111-12					
13		111-13	White ceramic floor tile - mens bathroom side D				
14		111-14					
15		111-15					
16		111-16	White ceramic wall tile - mens bathroom side D				

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	Point Count	400 Point*, 1000 Point*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Vermiculite	EPA 600*, Cincinnati Method	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Soil	EPA 600*, CARB 435	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
TEM	Air	EPA AHERA, NIOSH 7402	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Bulk	Chatfield	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Wipe	ASTM D6480-05	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Microvac	ASTM D5755-09	-	Same Day	1 Day	2 Day	3 Day	5 Day
PCM	Air	NIOSH 7400	3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-17	White ceramic wall tile - mens bathroom side D	Bulk	24hr		
2		111-18	"	"	"		
3		111-19	Brown wall material (bottom layer) - 1st fl mens bathroom 2	"	"		
4		111-20	"	"	"		
5		111-21	"	"	"		
6		111-22	Cove base mastic - 1st fl rear hall side C	"	"		
7		111-23	"	"	"		
8		111-24	"	"	"		
9		111-25	Door caulk - 1st fl hallway side C	"	"		
10		111-26	"	"	"		
11		111-27	"	"	"		
12		111-28	Wallpaper - 1st fl rear hall side C	"	"		
13		111-29	"	"	"		
14		111-30	"	"	"		
15		111-31	Mastic - 1st fl rear hall side C	"	"		
16		111-32	"	"	"		

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Analysis Type		Analysis Methods
PLM	Bulk	EPA 600*
	Point Count	400 Point*, 1000 Point*
	Vermiculite	EPA 600*, Cincinnati Method
	Soil	EPA 600*, CARB 435
TEM	Air	EPA AHERA, NIOSH 7402
	Bulk	Chatfield
	Wipe	ASTM D6480-05
	Microvac	ASTM D5755-09
PCM	Air	NIOSH 7400

Turnaround Times					
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Same Day	1 Day	2 Day	3 Day	5 Day
	Same Day	1 Day	2 Day	3 Day	5 Day
	Same Day	1 Day	2 Day	3 Day	5 Day
	Same Day	1 Day	2 Day	3 Day	5 Day
3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-33	Mastic - 1st fl rear hall side C	Bulk	24hr		
2		111-34	Vinyl floor tile - 1st fl rear hallway side C				
3		111-35					
4		111-36					
5		111-37	Cove base mastic - 1st fl mechanical room side D				
6		111-38					
7		111-39					
8		111-40	Vinyl floor tile - 1 fl left rear hall				
9		111-41					
10		111-42					
11		111-40A	Top layer mastic				
12		111-41A					
13		111-42A					
14		111-40B	Bottom layer mastic				
15		111-41B					
16		111-42B					

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Analysis Type		Analysis Methods	Turnaround Times					
PLM	Bulk	EPA 600*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Point Count	400 Point*, 1000 Point*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Vermiculite	EPA 600*, Cincinnati Method	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Soil	EPA 600*, CARB 435	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
TEM	Air	EPA AHERA, NIOSH 7402	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Bulk	Chatfield	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Wipe	ASTM D6480-05	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Microvac	ASTM D5755-09	-	Same Day	1 Day	2 Day	3 Day	5 Day
PCM	Air	NIOSH 7400	3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-43	Black ceramic wall tile - 1st fl mens bathroom 2	Bulk	24hr		
2		111-44					
3		111-45					
4		111-46	Black ceramic floor tile				
5		111-47					
6		111-48					
7		111-49	Vinyl floor tile - 2nd fl left rear room (below carpet)				
8		111-50					
9		111-51					
10		111-52	Mastic				
11		111-53					
12		111-54					
13		111-55	Green vinyl floor tile - 2nd fl front left room				
14		111-56					
15		111-57					
16		111-58	Mastic				

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Analysis Type		Analysis Methods
PLM	Bulk	EPA 600*
	Point Count	400 Point*, 1000 Point*
	Vermiculite	EPA 600*, Cincinnati Method
	Soil	EPA 600*, CARB 435
TEM	Air	EPA AHERA, NIOSH 7402
	Bulk	Chatfield
	Wipe	ASTM D6480-05
	Microvac	ASTM D5755-09
PCM	Air	NIOSH 7400

Turnaround Times					
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-59	Mastic - 2nd fl front left room	Bulk	24hr		
2		111-60					
3		111-61	Floor caulk - 2nd fl left front room				
4		111-62					
5		111-63					
6		111-64	Vinyl sheet floor - 2nd l left front room				
7		111-65					
8		111-66					
9		111-67	Mastic				
10		111-68					
11		111-69					
12		111-70	Grey floor material - 2nd fl left front room				
13		111-71					
14		111-72					
15		111-73	Mastic				
16		111-74					

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Analysis Type		Analysis Methods	Turnaround Times					
PLM	Bulk	EPA 600*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Point Count	400 Point*, 1000 Point*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Vermiculite	EPA 600*, Cincinnati Method	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Soil	EPA 600*, CARB 435	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
TEM	Air	EPA AHERA, NIOSH 7402		Same Day	1 Day	2 Day	3 Day	5 Day
	Bulk	Chatfield		Same Day	1 Day	2 Day	3 Day	5 Day
	Wipe	ASTM D6480-05	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Microvac	ASTM D5755-09	-	Same Day	1 Day	2 Day	3 Day	5 Day
PCM	Air	NIOSH 7400	3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-75	Mastic - 2nd fl left front room	Bulk	24hr		
2		111-76	Red vinyl floor tile - 2nd fl left front room				
3		111-77					
4		111-78					
5		111-79	Mastic				
6		111-80					
7		111-81					
8		111-82	Plaster brown coat - 2nd fl left front room				
9		111-83					
10		111-84					
11		111-85	Light grey plaster material - 2nd fl mechanical room				
12		111-86					
13		111-87					
14		111-88	Block mortar - 2nd fl mechanical room				
15		111-89					
16		111-90					

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Analysis Type		Analysis Methods
PLM	Bulk	EPA 600*
	Point Count	400 Point*, 1000 Point*
	Vermiculite	EPA 600*, Cincinnati Method
	Soil	EPA 600*, CARB 435
TEM	Air	EPA AHERA, NIOSH 7402
	Bulk	Chatfield
	Wipe	ASTM D6480-05
	Microvac	ASTM D5755-09
PCM	Air	NIOSH 7400

Turnaround Times					
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-91	Block - 2nd fl mechanical room	Bulk	24hr		
2		111-92					
3		111-93					
4		111-94	Plaster brown coat - 2nd fl mechanical room				
5		111-95					
6		111-96					
7		111-97	Carpet - 2nd fl front left room				
8		111-98					
9		111-99					
10		111-97A	Mastic				
11		111-98A					
12		111-99A					
13		111-100	Brick mortar - 2nd fl mechanical room				
14		111-101					
15		111-102					
16		111-103	Brick - 2nd fl mechanical room				

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Collector: Alexis Bailey & Austin Jackson	
Date Collected: 10/15/26	

Mobile: 804-883-6762 | Email: info@eesiva.com

Note:

Analysis Type		Analysis Methods	Turnaround Times					
PLM	Bulk	EPA 600*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Point Count	400 Point*, 1000 Point*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Vermiculite	EPA 600*, Cincinnati Method	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Soil	EPA 600*, CARB 435	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
TEM	Air	EPA AHERA, NIOSH 7402		Same Day	1 Day	2 Day	3 Day	5 Day
	Bulk	Chatfield		Same Day	1 Day	2 Day	3 Day	5 Day
	Wipe	ASTM D6480-05		Same Day	1 Day	2 Day	3 Day	5 Day
	Microvac	ASTM D5755-09		Same Day	1 Day	2 Day	3 Day	5 Day
PCM	Air	NIOSH 7400	3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-104	Brick - 2nd fl mechanical room	Bulk	24hr		
2		111-105					
3		111-106	Plaster skim coat - 2nd fl left front room				
4		111-107					
5		111-108					
6		111-109	Ceiling tile (divits) - 2nd fl front left room				
7		111-110					
8		111-111					
9		111-112	Ceiling tile (long lines)				
10		111-113					
11		111-114					
12		111-115	Cabinet caulk - 2nd fl front left room				
13		111-116					
14		111-117					
15		111-118	Cove base (black) mastic - 2nd fl left front room				
16		111-119					

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	Vermiculite	EPA 600*, Cincinnati Method
	Soil	EPA 600*, CARB 435
TEM	Air	EPA AHERA, NIOSH 7402
	Bulk	Chatfield
	Wipe	ASTM D6480-05
	Microvac	ASTM D5755-09
PCM	Air	NIOSH 7400

Turnaround Times					
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-120	Cove base (black) mastic - 2nd fl left front room	Bulk	24hr		
2		111-121	Roof sealant - 2nd fl mechanical room				
3		111-122					
4		111-123					
5		111-124	Carpet mastic - front left office adj. conference room				
6		111-125					
7		111-126					
8		111-127	Wallpaper - 2nd fl left front room				
9		111-128					
10		111-129					
11		111-130	Wall surfacing material (on wallpaper) 2nd fl left front room				
12		111-131					
13		111-132					
14		111-133	Wall surfacing - 2nd fl left fron room				
15		111-134					
16		111-135					

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	Point Count	400 Point*, 1000 Point*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Vermiculite	EPA 600*, Cincinnati Method	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Soil	EPA 600*, CARB 435	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
TEM	Air	EPA AHERA, NIOSH 7402		Same Day	1 Day	2 Day	3 Day	5 Day
	Bulk	Chatfield		Same Day	1 Day	2 Day	3 Day	5 Day
	Wipe	ASTM D6480-05		Same Day	1 Day	2 Day	3 Day	5 Day
	Microvac	ASTM D5755-09		Same Day	1 Day	2 Day	3 Day	5 Day
PCM	Air	NIOSH 7400	3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-136	Grey window caulk - exterior side C	Bulk	24hr		
2		111-137					
3		111-138					
4		111-139	Black window caulk - exterior side C				
5		111-140					
6		111-141					
7		111-142	Lintel caulk - exterior rear				
8		111-143					
9		111-144					
10		111-145	Window frame caulk - exterior rear				
11		111-146					
12		111-147					
13		111-148	Window frame caulk - exterior side B				
14		111-149					
15		111-150					
16		111-151	Window caulk - exterior side B				

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	Point Count	400 Point*, 1000 Point*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Vermiculite	EPA 600*, Cincinnati Method	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Soil	EPA 600*, CARB 435	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
TEM	Air	EPA AHERA, NIOSH 7402	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Bulk	Chatfield	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Wipe	ASTM D6480-05	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Microvac	ASTM D5755-09	-	Same Day	1 Day	2 Day	3 Day	5 Day
PCM	Air	NIOSH 7400	3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-152	Window caulk - exterior side B	Bulk	24hr		
2		111-153					
3		111-154	Window caulk - exterior rear				
4		111-155					
5		111-156					
6		111-157	Wall caulk - lef to f exterior door side C				
7		111-158					
8		111-159					
9		111-160	Wall surfacing material - mechanical room wall C				
10		111-161					
11		111-162					
12		111-163	Joint compound				
13		111-164					
14		111-165					
15		111-166	Drywall				
16		111-167					

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26056427

Job Number:	Job Name: Town of South Hill 111 E Danville St, South Hill, Virginia 23970
Collector: Alexis Bailey & Austin Jackson	Mobile: 804-883-6762 | Email: info@eesiva.com
Date Collected: 10/15/26	Note:

Analysis Type		Analysis Methods
PLM	Bulk	EPA 600*
	Point Count	400 Point*, 1000 Point*
	Vermiculite	EPA 600*, Cincinnati Method
	Soil	EPA 600*, CARB 435
TEM	Air	EPA AHERA, NIOSH 7402
	Bulk	Chatfield
	Wipe	ASTM D6480-05
	Microvac	ASTM D5755-09
PCM	Air	NIOSH 7400

Turnaround Times					
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-168	Drywall	Bulk	24hr		
2		111-169	Vinyl floor - room 1 left bathroom				
3		111-170					
4		111-171					
5		111-172	Mastic				
6		111-173					
7		111-174					
8		111-178	Wallpaper - room 1 left bathroom				
9		111-179					
10		111-180					
11		111-181	Wallpaper caulk				
12		111-182					
13		111-183					
14		111-184	Vinyl floor tile - front left office				
15		111-185					
16		111-186					

Released by: Courtney Sargent | Date: | Received By: MB1 | Date: 10/19/26

HAYES MICROBIAL CONSULTING

Ecosystems Environmental Services
7480 Lee Davis Rd
Suite 8
Mechanicsville, VA 23111

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PS - SD
0-19-2026

39 1027 820

ASBESTOS

26056427

Job Number:	Job Name: Town of South Hill 111 E Danville St, South Hill, Virginia 23970
Collector: Alexis Bailey & Austin Jackson	Mobile: 804-883-6762 Email: info@eesiva.com
Date Collected: 10/15/26	Note:

Analysis Type		Analysis Methods
PLM	Bulk	EPA 600*
	Point Count	400 Point*, 1000 Point*
	Vermiculite	EPA 600*, Cincinnati Method
	Soil	EPA 600*, CARB 435
TEM	Air	EPA AHERA, NIOSH 7402
	Bulk	Chatfield
	Wipe	ASTM D6480-05
	Microvac	ASTM D5755-09
PCM	Air	NIOSH 7400

Turnaround Times					
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
-	Same Day	1 Day	2 Day	3 Day	5 Day
3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-187	Mastic (top layer) - front left office	Bulk	24hr		
2		111-188					
3		111-189					
4		111-190	Mastic (bottom layer)				
5		111-191					
6		111-192					
7		111-193	Roof sealnt (on top of roof)				
8		111-194					
9		111-195					
10		111-196	Wall mastic - vault room				
11		111-197					
12		111-198					
13		111-199	Vinyl floor tile - vault room				
14		111-200					
15		111-201					
16		111-202	Mastic - vault room				

Released by: Courtney Sargent Date:

Received By: MBA Date: 10/17/26

HAYES
MICROBIAL CONSULTING

Ecosystems Environmental Services
7480 Lee Davis Rd
Suite 8
Mechanicsville, VA 23111

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ASBESTOS
26056427

Job Number:	Job Name: Town of South Hill 111 E Danville St, South Hill, Virginia 23970
Collector: Alexis Bailey & Austin Jackson	Mobile: 804-883-6762 / Email: info@eesiva.com
Date Collected: 10/15/26	Note:

Analysis Type		Analysis Methods	Turnaround Times					
PLM	Bulk	EPA 600*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Point Count	400 Point*, 1000 Point*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Vermiculite	EPA 600*, Cincinnati Method	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Soil	EPA 600*, CARB 435	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
TEM	Air	EPA AHERA, NIOSH 7402	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Bulk	Chatfield	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Wipe	ASTM D6480-05	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Microvac	ASTM D5755-09	-	Same Day	1 Day	2 Day	3 Day	5 Day
PCM	Air	NIOSH 7400	3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1		111-203	Mastic - vault room	Bulk	24hr		
2		111-204					
3		111-205	Carpet mastic - vault room				
4		111-206					
5		111-207					
6		111-208	Wallpaper - mechanical room				
7		111-209					
8		111-210					
9							
10							
11							
12							
13							
14							
15							
16							

Released by: Courtney Sargent | Date: | Received By: MBA | Date: 10/17/26

Town of South Hill
111 E Danville St, South Hill, VA 23970

Date	Test #	Room	Location	Side	LocationWi	Color	Substrate	Calibration	Pb +/-	Pb P/F	Unit Type
10/15/2026 10:26	1							PCS Cal	0.1	Negative	mg/cm2
10/15/2026 10:26	2							PCS Cal	0.1	Negative	mg/cm2
10/15/2026 10:26	3							PCS Cal	0.1	Negative	mg/cm2
10/15/2026 10:26	4							PCS Cal	0.1	Negative	mg/cm2
10/15/2026 10:31	5	Room 1	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:31	6	Room 2	Wall	B	Upper wall	White		LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:32	7	Room 1	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:33	8	Room 1	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:34	9	Room 1	Wall	B	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:35	10	Room 1	Wall	B	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:35	11	Room 1	Other	C	Cabinet	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:36	12	Room 1	Door	D	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:37	13	Room 1	Other	C	Shelf	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:38	14	Room 1	Other	C	Shelf suppc	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:39	15	Room 1	Door	B	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:40	16	Room 1	Door	B	Door	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:40	17	Room 1	Door	D	Door	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:43	18	Room 1 bat	Wall	A	Upper wall	Wallpaper	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:44	19	Room 1 bat	Wall	B	Upper wall	Wallpaper	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:44	20	Room 1 bat	Wall	C	Upper wall	Wallpaper	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:45	21	Room 1 bat	Wall	D	Upper wall	Wallpaper	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:50	22	Room 1	Door	D	Jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:51	23	Room 1	Door	D	Jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:51	24	Room 1	Door	D	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:52	25	Room 1	Window	B	Sill	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:53	26	Room 1	Window	B		Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:53	27	Room 1	Window	B	Sash	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:54	28	Room 1 bat	Window	C		Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:55	29	Left rear ha	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:56	30	Left rear ha	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:57	31	Left rear ha	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:57	32	Left rear ha	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:58	33	Left rear ha	Ceiling	B	Ceiling	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:58	34	Left rear ha	Wall	B	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:58	35	Left rear ha	Wall	B	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:59	36	Left rear ha	Door	B	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:59	37	Left rear ha	Door	C	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 10:59	38	Left rear ha	Door	C	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:01	39	Left rear ha	Door	D	Door	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:01	40	Left rear ha	Wall	B	Crown mol	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:02	41	Left rear ha	Door	D	Left jamb	Green	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:03	42	Left rear ha	Other	D	Shelf	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:04	43	Left rear ha	Door	D	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:04	44	Left rear ha	Door	D	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:04	45	Left rear ha	Other	D	Electric par	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:05	46	Left rear ha	Other	D	Return grill	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:06	47	Left rear ha	Door	A	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:07	48	Room 2	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:07	49	Room 2	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:07	50	Room 2	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:07	51	Room 2	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:08	52	Room 2	Ceiling	A	Ceiling cha	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:08	53	Room 2	Ceiling	A	Ceiling tile	White	Ceramic	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:08	54	Room 2	Wall	C	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:09	55	Room 2	Wall	C	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:09	56	Room 2	Door	B	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:10	57	Room 2	Door	B	Right jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2

10/15/2026 11:10	58	Room 2	Door	C	Right vault	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:11	59	Room 2	Right vault	C	Side B	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:11	60	Room 2	Right vault	C	Side A	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:13	61	Left vault	Wall	B	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:13	62	Left vault	Wall	A	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:13	63	Left vault	Wall	C	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:13	64	Left vault	Wall	D	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:14	65	Left vault	Ceiling	A	Ceiling	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:15	66	Front left ha	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:15	67	Front left ha	Door	D	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:17	68	Front left ha	Wall	D	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:17	69	Front left ha	Wall	D	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:17	70	Front left ha	Door	B	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:17	71	Front left ha	Door	B	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:18	72	Conference	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:18	73	Conference	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:18	74	Conference	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:19	75	Conference	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:19	76	Conference	Wall	D	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:19	77	Conference	Door	C	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:19	78	Conference	Door	C	Right casin	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:19	79	Conference	Door	B	Door	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:20	80	Conference	Door	B	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:20	81	Conference	Door	A	Door	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:22	82	Conference	Door	A	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:22	83	Conference	Door	A	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:25	84	Conference	Window	A	Sill	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:27	85	Conference	Wall	A	Crown mol	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:29	86	Room 3	Wall	A	Upper wall	Beige	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:29	87	Room 3	Wall	B	Upper wall	Beige	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:30	88	Room 3	Wall	C	Upper wall	Beige	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:30	89	Room 3	Wall	D	Upper wall	Beige	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:30	90	Room 3	Wall	A	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:31	91	Room 3	Wall	A	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:32	92	Room 3	Ceiling	C	Ceiling	Beige	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:34	93	Room 3	Wall	B	Crown mol	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:36	94	Front left ha	Wall	D	Crown mol	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:37	95	Room 4	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:37	96	Room 4	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:37	97	Room 4	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:38	98	Room 4	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:38	99	Room 4	Wall	D	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:38	100	Room 4	Wall	D	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:38	101	Room 4	Window		Sill	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:39	102	Room 5	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:39	103	Room 5	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:39	104	Room 5	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:40	105	Room 5	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:40	106	Room 5	Wall	D	Upper wall	White	Unkown	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:42	107	Room 6	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:42	108	Room 6	Wall	B	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:42	109	Room 6	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:43	110	Room 6	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:43	111	Room 6	Wall	A	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:43	112	Room 6	Door	A	Vault door	Beige	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:44	113	Room 6	Wall	A	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:44	114	Room 6	Wall	A	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:45	115	Room 6	Wall	C	Crown mol	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2

10/15/2026 11:45	116	Room 7	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:46	117	Room 7	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:46	118	Room 7	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:46	119	Room 7	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:46	120	Room 7	Wall	A	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:47	121	Room 7	Wall	A	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:47	122	Room 7	Window	A	Sill	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:47	123	Room 7	Window	B	Left casing	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:47	124	Room 7	Window	B	Part bead	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:48	125	Vestibule	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:49	126	Vestibule	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:49	127	Vestibule	Wall	B	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:49	128	Vestibule	Window	B	Sill	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:49	129	Vestibule	Window	B	Part bead	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:50	130	Vestibule	Door	C	Left casing	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:50	131	Vestibule	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:50	132	Vestibule	Door	A	Header	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:57	133	Open area	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:57	134	Open area	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 11:57	135	Open area	Wall	D	Upper wall	Tan	Wallpaper	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:01	136	Open area	Window	A	Part bead	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:01	137	Open area	Window	A	Left casing	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:01	138	Open area	Wall	A	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:01	139	Open area	Wall	A	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:01	140	Open area	Door	A	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:02	141	Open area	Door	A	Door	Varnish	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:02	142	Open area	Door	A	Left casing	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:03	143	Open area	Other	D	Half wall ca	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:03	144	Open area	Door	C	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:03	145	Open area	Door	C	Door	Varnish	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:04	146	Open area	Door	B	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:04	147	Open area	Door	B	Door	Varnish	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:06	148	Room 8	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:06	149	Room 8	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:07	150	Room 8	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:07	151	Room 8	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:07	152	Room 8	Wall	D	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:07	153	Room 8	Wall	D	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:09	154	Room 8	Wall	D	Crown mol	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:10	155	Room 8	Door	C	Right jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:10	156	Room 9	Wall	A	Upper wall	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:10	157	Room 9	Wall	B	Upper wall	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:11	158	Room 9	Wall	C	Upper wall	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:11	159	Room 9	Wall	D	Upper wall	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:11	160	Room 9	Window	D	Sill	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:12	161	Room 9	Wall	B	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:12	162	Room 9	Wall	B	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:12	163	Room 9	Door	A	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:13	164	Mechanical	Wall	A	Upper wall	Wallpaper	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:13	165	Mechanical	Wall	B	Upper wall	Wallpaper	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:13	166	Mechanical	Wall	C	Upper wall	Wallpaper	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:13	167	Mechanical	Wall	D	Upper wall	Wallpaper	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:14	168	Mechanical	Wall	C	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:14	169	Mechanical	Wall	C	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:15	170	Mechanical	Wall	C	Crown mol	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:15	171	Mechanical	Other	C	Shelf	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:15	172	Mechanical	Other	D	Wall behinc	Grey	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:18	173	Women's b	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2

10/15/2026 12:18	174	Women's b	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:18	175	Women's b	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:18	176	Women's b	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:19	177	Women's b	Wall	A	Crown mol	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:20	178	Front right l	Wall	C	Upper wall	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:21	179	Front right l	Wall	B	Crown mol	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:21	180	Right rear h	Wall	A	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:21	181	Right rear h	Wall	B	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:22	182	Right rear h	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:22	183	Right rear h	Wall	D	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:24	184	Right rear h	Door	D	Right jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:24	185	Right rear h	Door	D	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:24	186	Right rear h	Door	C	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:24	187	Right rear h	Door	C	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:25	188	Right rear h	Door	B	Door	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:25	189	Right rear h	Door	B	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:26	190	Right rear h	Wall	A	Chair rail	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:27	191	Men's bathı	Wall	A	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:27	192	Men's bathı	Wall	B	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:28	193	Men's bathı	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:28	194	Men's bathı	Wall	D	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:28	195	Men's bathı	Door	D	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:28	196	Men's bathı	Door	B	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:29	197	Men's bathı	Wall	A	Upper wall	Off-white	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:29	198	Men's bathı	Wall	B	Upper wall	Off-white	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:29	199	Men's bathı	Wall	C	Upper wall	Off-white	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:30	200	Men's bathı	Wall	D	Upper wall	Off-white	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:30	201	Men's bathı	Wall	A	Lower wall	White	Ceramic Til	LeadPaint	0.1	Positive	mg/cm2
10/15/2026 12:30	202	Men's bathı	Wall	B	Lower wall	White	Ceramic Til	LeadPaint	0.3	Positive	mg/cm2
10/15/2026 12:30	203	Men's bathı	Wall	C	Lower wall	White	Ceramic Til	LeadPaint	0.1	Positive	mg/cm2
10/15/2026 12:30	204	Men's bathı	Wall	D	Lower wall	White	Ceramic Til	LeadPaint	0.4	Positive	mg/cm2
10/15/2026 12:30	205	Men's bathı	Wall	A	Lower wall	Black	Ceramic Til	LeadPaint	0.1	Positive	mg/cm2
10/15/2026 12:30	206	Men's bathı	Wall	B	Lower wall	Black	Ceramic Til	LeadPaint	0.1	Positive	mg/cm2
10/15/2026 12:30	207	Men's bathı	Wall	C	Lower wall	Black	Ceramic Til	LeadPaint	0.1	Positive	mg/cm2
10/15/2026 12:30	208	Men's bathı	Wall	D	Lower wall	Black	Ceramic Til	LeadPaint	0.1	Positive	mg/cm2
10/15/2026 12:30	209	Men's bathı	Floor	D	Floor	Black/Whit	Ceramic Til	LeadPaint	0.1	Positive	mg/cm2
10/15/2026 12:32	210	Men's bathı	Door	C	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:33	211	Women's b	Wall	A	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:33	212	Women's b	Wall	B	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:33	213	Women's b	Wall	C	Upper wall	White	Drywall	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:33	214	Women's b	Wall	D	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:33	215	Women's b	Door	B	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:33	216	Women's b	Door	B	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:36	217	Electrical r	Other	C	Sink	White	Metal	LeadPaint	0.2	Positive	mg/cm2
10/15/2026 12:36	218	Electrical r	Door	D	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:36	219	Electrical r	Other	B	Metal supp	Red	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:37	220	Electrical r	Other	D	Metal supp	Red	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:39	221	Stairwell	Door	B	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:39	222	Stairwell	Wall	A	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:40	223	Stairwell	Wall	D	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:40	224	Stairwell	Wall	C	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:40	225	Stairwell	Other	C	Newl post	Varnish	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:41	226	Stairwell	Other	C	Stringer	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:41	227	Stairwell	Other	C	Rail suppor	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:41	228	Stairwell	Wall	C	Wide baset	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:42	229	Stairwell	Wall	C	Thin baseb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:42	230	Stairwell	Other	C	Baluster	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:43	231	Stairwell	Other	C	Rail cap	Varnish	Wood	LeadPaint	0.1	Negative	mg/cm2

10/15/2026 12:44	232	2nd floor ha	Wall	A	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:44	233	2nd floor ha	Wall	B	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:44	234	2nd floor ha	Wall	D	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:45	235	2nd floor ha	Window	C	Sill	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:46	236	2nd floor ha	Wall	B	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:47	237	2nd floor ha	Other	D	Rail cap	Varnish	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:47	238	2nd floor ha	Other	D	Baluster	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:47	239	2nd floor ha	Other	D	Rail suppor	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:47	240	2nd floor ha	Door	B	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:48	241	2nd floor ha	Door	A	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:48	242	2nd floor ha	Door	D	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:48	243	2nd floor ha	Door	B	Door	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:48	244	2nd floor ha	Door	A	Door	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:49	245	2nd floor ha	Door	D	Door	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:49	246	2nd fl left re	Wall	A	Upper wall	White	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:49	247	2nd fl left re	Wall	B	Upper wall	White	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:50	248	2nd fl left re	Wall	C	Upper wall	White	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:50	249	2nd fl left re	Wall	D	Upper wall	White	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:50	250	2nd fl left re	Other	D	Duct	White	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:50	251	2nd fl left re	Other	A	Shelf	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:50	252	2nd fl left re	Other	A	Shelf suppc	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:51	253	2nd fl left re	Other	C	Pipe	White	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:53	254	2nd fl left fr	Wall	A	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:54	255	2nd fl left fr	Wall	B	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:54	256	2nd fl left fr	Wall	C	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:54	257	2nd fl left fr	Wall	D	Upper wall	White	Plaster	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:54	258	2nd fl left fr	Window	B	Sill	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:55	259	2nd fl left fr	Window	C	Sill	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:55	260	2nd fl left fr	Wall	D	Baseboard	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 12:55	261	2nd fl left fr	Door	D	Left jamb	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:02	262	2nd fl left fr	Wall	A	Upper wall	White	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:02	263	2nd fl left fr	Wall	D	Upper wall	White	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:02	264	2nd fl left fr	Wall	C	Upper wall	White	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:05	265	2nd fl left fr	Other	D	Shelf	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:06	266	2nd fl left fr	Other	D	Shelf suppc	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:06	267	2nd fl left fr	Door	D	Left jamb	Off-white	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:06	268	2nd fl left fr	Door	D	Door	Off-white	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:14	269	Left mecha	Wall	C	Upper wall	Off-white	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:15	270	Left mecha	Wall	D	Upper wall	Off-white	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:15	271	Left mecha	Wall	A	Upper wall	Off-white	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:16	272	Left mecha	Other	A	Pipe	Grey	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:16	273	Left mecha	Other	D	Plywood	White	Wood	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:16	274	Left mecha	Floor	A	Floor	Grey	Concrete	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:27	275	Left mecha	Wall	B	Upper wall	Off-white	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:27	276	Left mecha	Other	B	Pipe	Grey	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:27	277	Left mecha	Stairs	B	Stair tread	Grey	Concrete	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:28	278	Left mecha	Stairs	B	Stair riser	Grey	Concrete	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:30	279	Left mecha	Door	D	Right jamb	White	Unkown	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:31	280	Right mech	Wall	C	Upper wall	Off-white	Block	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:31	281	Right mech	Door	C	Door	White	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 13:32	282	Right mech	Door	C	Left jamb	White	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 15:52	283							PCS Cal	0.1	Positive	mg/cm2
10/15/2026 15:52	284							PCS Cal	0.1	Positive	mg/cm2
10/15/2026 15:52	285							PCS Cal	0.1	Positive	mg/cm2
10/15/2026 15:52	286							PCS Cal	0.1	Positive	mg/cm2
10/15/2026 15:52	287	Exterior	Door	C	Door	Black	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 15:53	288	Exterior	Door	C	Left casing	Black	Metal	LeadPaint	0.1	Negative	mg/cm2
10/15/2026 15:53	289	Exterior	Window	C	Sill	Black	Metal	LeadPaint	0.1	Negative	mg/cm2

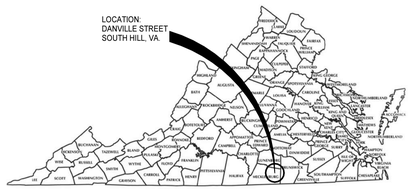
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10/15/2026 15:55	291 Exterior	Door	C	Lintel	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 15:55	292 Exterior	Door	C	Lintel trim	Black	Wood	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:08	293 Exterior	Window	C	Window	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:08	294 Exterior	Door	C	Door	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:08	295 Exterior	Door	C	Left casing	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:09	296 Exterior	Other	C	Overhang	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:10	297 Exterior	Other	C	Gutter	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:10	298 Exterior	Other	C	Overhang	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:10	299 Exterior	Other	C	Box	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:10	300 Exterior	Other	C	Pipe	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:11	301 Exterior	Other	C	Box below p	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:18	302 Exterior	Window	B	Window	Black	Metal	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:26	303 Exterior		A	Ceiling	White	Unkown	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:27	304 Exterior		A	Ceiling		Unkown	LeadPaint	0.1 Negative	mg/cm2
10/15/2026 16:28	307						PCS Cal	0.1 Positive	mg/cm2
10/15/2026 16:28	308						PCS Cal	0.1 Positive	mg/cm2
10/15/2026 16:28	309						PCS Cal	0.1 Positive	mg/cm2
10/15/2026 16:28	310						PCS Cal	0.1 Positive	mg/cm2

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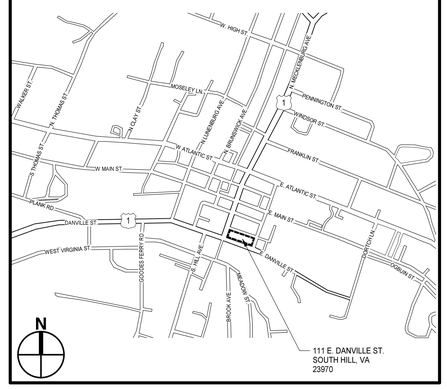
SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
SOUTH HILL, VIRGINIA

VICINITY MAP



LOCATION MAP



Moseley

3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555 FAX (804) 355-5690

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B & B CONSULTANTS, INC. — CIVIL ENGINEERS

212 E FERRELL STREET — SOUTH HILL, VA 23970 - (434) 447-7621

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G4.1.1	GENERAL INFORMATION - AIR BARRIER	A3.2.1	WALL SECTION DETAILS	S3.3.1	FRAMING SECTIONS	E1.1.1	FLOOR PLANS - LIGHTING
		A3.2.2	WALL SECTION DETAILS	S3.3.2	FRAMING SECTIONS	E1.1.2	FLOOR PLANS - POWER
CIVIL		A5.1.1	TOILET ASSEMBLIES, SCHEDULE AND ENLARGED PLANS	S3.3.3	FRAMING SECTIONS	E1.1.3	FLOOR PLANS - COMMUNICATIONS
C-0.0	CIVIL COVER SHEET	A5.2.1	ENLARGED PLANS, ELEVATIONS, AND DETAILS	S3.3.4	FRAMING SECTIONS	E1.1.4	FLOOR PLANS - MECH POWER
C-1.0	MASTER PLAN	A5.3.1	DETENTION EQUIPMENT DETAILS	S3.3.5	FRAMING SECTIONS	E1.1.5	SECURITY FLOOR PLANS
C-1.1	EXISTING CONDITIONS & DEMOLITION PLAN	A6.1.1	DOOR AND FRAME SCHEDULE			E1.2	ROOF PLAN - ELECTRICAL
C-1.2	LAYOUT PLAN	A6.1.2	DOOR, FRAME AND GLAZING TYPES	PLUMBING		E5.1	DETAILS
C-1.3	UTILITY PLAN	A6.2.1	DOOR AND FRAME DETAILS	P0.1.1	LEGENDS, ABBREVIATIONS AND GENERAL NOTES	E5.2	DETAILS
C-1.4	GRADING & DRAINAGE PLAN	A6.2.2	DOOR AND FRAME DETAILS	P0.3.1	DEMOLITION FLOOR PLAN	E5.3	DETAILS
C-2.1	CONSTRUCTION DETAILS	A6.2.3	DOOR AND FRAME DETAILS	P1.0.1	FOUNDATION PLAN - PLUMBING	E6.1	POWER ONE-LINE DIAGRAM
C-2.2	UTILITY DETAILS	A6.2.4	DOOR AND FRAME DETAILS	P1.1.1	FLOOR PLANS - SANITARY	E7.1	PANELBOARD SCHEDULES
C-3.1	E&S CONTROL NARRATIVE & DETAILS	A6.3.1	DETENTION DOOR SCHEDULE, FRAME AND GLAZING TYPES	P1.1.2	FLOOR PLANS - DOMESTIC		
C-3.2	E&S CONTROL PLAN			P1.1.3	ROOF PLAN - PLUMBING		
C-4.1	DRAINAGE DIVIDE MAPS	A7.0.1	FINISH SCHEDULE AND ELEVATIONS	P4.1	ENLARGED FLOOR PLANS		
C-5.1	MOT/TTC PLAN	A7.1.1	FINISH PLAN	P5.1	DETAILS		
		A7.2.1	INTERIOR ELEVATIONS	P6.1	SCHEDULES		
ARCHITECTURAL		A7.3.1	ENLARGED CASEWORK PLANS AND ELEVATIONS	P9.1	PIPING DIAGRAMS		
A0.1.1	GENERAL ARCHITECTURAL INFORMATION	A7.3.2	CASEWORK ELEVATIONS AND SECTIONS	P9.2	PIPING DIAGRAMS		
A0.1.2	ASSEMBLIES	A7.3.3	CASEWORK SECTIONS				
A0.1.3	ASSEMBLIES	A7.4.1	OVERALL FURNITURE PLAN	FIRE PROTECTION			
A0.2.1	ARCHITECTURAL SITE PLAN	A8.1.1	INTERIOR-EXTERIOR SIGNAGE	FP0.1.1	LEGENDS, ABBREVIATIONS AND GENERAL NOTES		
A0.2.2	ARCHITECTURAL SITE PLAN DETAILS			FP1.1.1	FLOOR PLANS - FIRE PROTECTION		
A0.2.3	ARCHITECTURAL SITE PLAN DETAILS	STRUCTURAL					
A0.3.1	DEMOLITION PLANS	S0.1.1	GENERAL NOTES AND LEGENDS	MECHANICAL			
A1.1.1	FLOOR PLANS	S0.1.2	SCHEDULE OF SPECIAL INSPECTIONS - 2021 IBC	M0.1.1	LEGENDS, ABBREVIATIONS AND GENERAL NOTES		
A1.1.2	FLOOR PLAN DETAIL LOCATIONS	S0.1.3	COMPONENTS AND CLADDING WIND PRESSURES	M0.3.1	MECHANICAL DEMOLITION PLAN		
A1.1.3	DIMENSION FLOOR PLANS	S1.0.1	FOUNDATION PLAN	M1.1	FLOOR PLANS		
A1.2.1	REFLECTED CEILING PLAN	S1.0.2	SLAB ON GRADE CONTROL JOINT LAYOUT PLAN	M1.2	ROOF PLAN		
A1.3.1	ROOF PLAN	S1.1.1	SECOND FLOOR FRAMING PLAN	M5.1	DETAILS		
A1.4.1	FLOOR PLAN DETAILS	S1.1.2	ROOF FRAMING PLANS	M5.2	DETAILS		
A1.4.2	FLOOR PLAN DETAILS	S3.1.1	TYPICAL FOUNDATION DETAILS	M6.1	SCHEDULES		
A2.1.1	EXTERIOR BUILDING ELEVATIONS	S3.1.2	TYPICAL SLAB DETAILS	M8.1	MECHANICAL CONTROL DIAGRAMS		

THE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL.
IN CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026

SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

COVER

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CODE DATA SUMMARY

THIS SUMMARY DOES NOT IDENTIFY ALL APPLICABLE CODE SECTIONS AND IS A SUMMARY OF SELECTED CODE SECTIONS ONLY. CODE SECTIONS NOT IDENTIFIED OR OTHERWISE INDICATED DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY TO COMPLY WITH APPLICABLE CODES, STANDARDS, AND REGULATIONS TO COMPLETE THE WORK.

VEBC CODE SUMMARY
2021 VIRGINIA EXISTING BUILDING CODE (VUSBC PART II), ALTERATION LEVEL 2, CHANGE IN OCCUPANCY
2021 VIRGINIA CONSTRUCTION CODE (VCC)

**REFER TO OTHER CONTRACT DOCUMENTS (DISCIPLINES) AND SPECIFICATIONS FOR ADDITIONAL CODE SUMMARY INFORMATION NOT INCLUDED IN THIS CODE SUMMARY (GENERALLY RELATED TO CHAPTERS 13 THROUGH 33).*

OCCUPANCY:
EXISTING - BUSINESS (NO CHANGE TO EXISTING CLASSIFICATION)

CONSTRUCTION TYPE:
EXISTING CONSTRUCTION TYPE: EXISTING ASSUMED EQUIVALENT TO IIB BASED ON SITE OBSERVATIONS AND INFORMATION PROVIDED BY OWNER.
EXISTING BUILDING IS NON-SPRINKLERED; SPRINKLER SYSTEM IS BEING ADDED TO THE EXISTING BUILDING. BUILDING ADDITIONS ARE SPRINKLERED.
PRIMARY STRUCTURAL FRAME: 0 HR
EXTERIOR BEARING WALLS: 0 HR
EXTERIOR NONBEARING NONBEARING WALLS: 0 HR
INTERIOR NONBEARING WALLS: 0 HR
EXIT ACCESS CORRIDORS: 0 HR
FLOOR CONSTRUCTION AND ASSOCIATED MEMBERS: 0 HR
ROOF CONSTRUCTION AND ASSOCIATED MEMBERS: 0 HR

RISK CATEGORY:
EXISTING BUILDING: UNKNOWN RISK CATEGORY
BUILDING: RISK CATEGORY IV (IBC TABLE 1604.5)

VUSBC CHANGE IN OCCUPANCY DEFINITION:
[A] CHANGE OF OCCUPANCY
EITHER OF THE FOLLOWING SHALL BE CONSIDERED A CHANGE OF OCCUPANCY WHERE THE CURRENT VCC REQUIRES A GREATER DEGREE OF STRUCTURAL STRENGTH, FIRE PROTECTION, MEANS OF EGRESS, VENTILATION OR SANITATION THAN IS EXISTING IN THE CURRENT BUILDING OR STRUCTURE:
1. ANY CHANGE IN THE OCCUPANCY CLASSIFICATION OF A BUILDING OR STRUCTURE.
2. ANY CHANGE IN THE PURPOSE OF, OR A CHANGE IN THE LEVEL OF ACTIVITY WITHIN, A BUILDING OR STRUCTURE

NOTE: THE USE AND OCCUPANCY CLASSIFICATION OF A BUILDING OR STRUCTURE, SHALL BE DETERMINED IN ACCORDANCE WITH CHAPTER 3 OF THE VCC.

AREA:
EXISTING BUILDING: 5,108 SF
LEVEL 2 ALTERATIONS: 5,108 SF
LEVEL 2 ALTERATIONS PERCENTAGE: 100%

FRONT ADDITION: 2,737 SF
REAR ADDITION: 2,371 SF

TOTAL BUILDING AREA: 10,216 SF

CHAPTER 6 ALTERATIONS:
601.2.2 LEVEL 2 - LEVEL 2 ALTERATIONS SHALL COMPLY WITH THE APPLICABLE PROVISIONS OF SECTIONS 602 AND 603 AND SHALL INCLUDE THE FOLLOWING:
1. THE ADDITION OR ELIMINATION OF ANY DOOR OR WINDOW.
2. THE ADDITION OR ELIMINATION OF ANY WALL, FLOOR, OR CEILING ASSEMBLY.
3. THE RECONFIGURATION OR EXTENSION OF ANY SYSTEM.
4. THE INSTALLATION OF ANY ADDITION, EQUIPMENT, MATERIALS, ELEMENTS OR FIXTURES.

603.3 COMPLIANCE - ALL NEW CONSTRUCTION ELEMENTS, COMPONENTS, SYSTEMS, AND SPACES SHALL COMPLY WITH THE REQUIREMENTS OF THE VCC.

603.5 MECHANICAL - IN MECHANICALLY VENTILATED SPACES, EXISTING MECHANICAL VENTILATION SYSTEMS THAT ARE ALTERED, RECONFIGURED, OR EXTENDED SHALL PROVIDE NOT LESS THAN 5 CUBIC FEET PER MINUTE (CFM) (0.0024 M³/S) PER PERSON OF OUTDOOR AIR AND NOT LESS THAN 15 CFM (0.0071 M³/S) OF VENTILATION AIR PER PERSON OR NOT LESS THAN THE AMOUNT OF VENTILATION AIR DETERMINED BY THE INDOOR AIR QUALITY PROCEDURE OF ASHRAE 62.

SAFEGUARDS DURING CONSTRUCTION:
MAINTAIN REQUIRED EXITS, FIRE PROTECTION DEVICES AND SANITARY SAFEGUARDS AT ALL TIMES; WHERE SUCH REQUIRED ELEMENTS OR DEVICES ARE BEING ALTERED OR REPAIRED, MAKE ADEQUATE SUBSTITUTE PROVISIONS.
HAZARDOUS WORK, IF ANY, SHALL COMPLY WITH VIRGINIA STATE FIRE PREVENTION CODE; PROVIDE FIRE WATCH.
REFER TO 015000 TEMPORARY FACILITIES AND 024119 SELECTIVE STRUCTURE DEMOLITION FOR ADDITIONAL SAFE GUARDS DURING CONSTRUCTION.

COMPLY WITH THE 2021 INTERNATIONAL FIRE CODE, CHAPTER 33 FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION.

COMPLY WITH NFPA 241 FOR CONDITIONS NOT COVERED BY CHAPTER 33 OF THE IFC AND VSFPC.

ADMINISTRATION

Applicable Codes, Standards, and/or References	Year
VIRGINIA EXISTING BUILDING CODE (VUSBC PART II), ALTERATION LEVEL 2	2021
VIRGINIA CONSTRUCTION CODE (VCC)	2021
ADA Standards for Accessible Design	2010
ICC A117.1	2017
Refer to other Contract Documents (disciplines) and Specifications for additional code summary information not included in this Code Summary (generally related to Chapters 13 through 33).	

USE AND OCCUPANCY CLASSIFICATION

	Classification	Group
302.1	Business	B
	Storage	S-1 (Moderate hazard)
	Storage	S-2 (Low-hazard)

GENERAL BUILDING HEIGHTS AND AREAS

504	**BUILDING HEIGHT AND NUMBER OF STORIES**
504.3	**Height in feet**
	Refer to Drawing G1.1.1 for allowable building height.
	Exception: Rooftop structures complying with Section 1511.
504.4	**Number of Stories**
	Refer to Drawing G1.1.1 for allowable number of stories.
506	**BUILDING AREA**
	Refer to Drawing G1.1.1 for allowable area[s] and modifications
506.2.1	**Area Determination [single-occupancy buildings]**
	Refer to Drawing G1.1.1 for additional information
508.1	**Mixed Use**
	Complies with nonseparated occupancies provisions per 508.3

TYPES OF CONSTRUCTION

Table 601	**Fire-Resistance Rating Requirements for Building Elements**
	Refer to Drawing G1.1.1
602.1	**Construction Classification**
	Type IIB

FIRE PROTECTION SYSTEMS

903	**AUTOMATIC SPRINKLER SYSTEMS**
	Building is fully sprinklered in accordance with 903.3.1.1 (NFPA 13)
906	**PORTABLE FIRE EXTINGUISHERS**
906.1	**Where required [portable fire extinguishers]**
	Item 1. Install in Groups A, B, E, F, H, I, M, R-1, R-2, R-4, and S occupancies
	Exception 1: In Group R-2 occupancies, only in locations specified in Items 2 through 6 where each dwelling unit is provided with a portable fire extinguisher having a minimum rating of 1-A:10-B:C
	Exception 2: In Group E occupancies, only in locations specified in items 2 through 6 where each classroom is provided with a portable fire extinguisher having a minimum rating of 2-A:20-B:C
	Item 2. Within 30 feet distance of travel from domestic cooking equipment.
	Item 3. In areas where flammable or combustible liquids are stored, used or dispensed.
	Item 4. On each floor of structures under construction, except Group R-3 occupancies, in accordance with Section 3315.1 of the International Fire Code.
	Item 5. Where required by the International Fire Code sections indicated in Table 906.1.
	Item 6. Special-hazard areas, including but not limited to laboratories, computer rooms and generator rooms, where required by the fire code official.
913	**FIRE PUMPS**
913.2.1	**Protection of fire pump rooms**
	Fire pumps rooms separated from all other areas by 2-hour fire barriers and/or 2-hour horizontal assemblies
	Exception 1: 1-hour fire barriers and/or horizontal assemblies where building is fully sprinklered (NFPA 13 or 13R) and not a high rise
	Exception 2: Fire pumps physically separated in accordance with NFPA 20

MEANS OF EGRESS

1003	**GENERAL MEANS OF EGRESS**
1004	**OCCUPANT LOAD**
1004.1	**Design Occupant Load**
	Refer to Drawing G.1.1 for the FACILITY OCCUPANT LOAD
	Refer to Drawings G1.1.1 for the OCCUPANCY SCHEDULE
1005	**MEANS OF EGRESS SIZING**
1005.2	**Minimum width based on component**
	Refer to Drawings G1.1.1 for egress capacities for exits and stairways
1006	**NUMBER OF EXITS AND EXIT ACCESS DOORWAYS**
Table 1006.2.1	**SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY**

Occupancy / Maximum Occupant Load of Space	Maximum Common Path of Egress Travel Distance (feet)		
	Without Sprinkler System		Sprinklered Maximum Common Path Travel Distance
	Occupant Load 30 or less	Occupant Load over 30	
B / 49	100	75	100
S / 29	100	75	100

1016	**EXIT ACCESS**
1017	**EXIT ACCESS TRAVEL DISTANCE**
1017.2	**Limitations [exit access travel distance]**
	200 feet w/o sprinkler system for B and S-1 occupancies
	300 feet w/o sprinkler system for S-2 occupancies
1020	**CORRIDORS**
Table 1020.2	**Corridor Fire-Resistance Rating**

Occupancy	Occupant Load served by corridor	Required Fire-Resistance Rating (hours)	
		Without sprinkler system	With sprinkler system
A, B, E, F, M, S, U	Greater than 30	1	0

1020.3	**Width and capacity [corridors]**
	Other than as listed below, minimum corridor width is determined by required egress width, but not less than 44 inches
	36 inches minimum where occupant load is less than 50
1020.5	**Dead ends**
	Exit access corridors shall not exceed 20 feet in length
	Exception 2: 50 feet in Groups B, E, F, I-1, M, R-1, S and U in fully sprinklered building (NFPA 13)

Moseley
3200 NORFOLK STREET. RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

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DATE DESCRIPTION

CODE SUMMARY

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PLUMBING FIXTURE COUNT

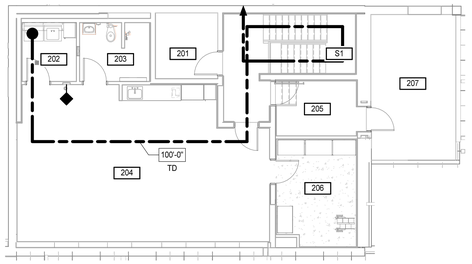
OCCUPANCY	OCC LOAD	WATER CLOSETS						LAVATORIES						BATH TUBS/SHOWERS			DRINKING FOUNTAINS			SERVICE SINKS	
		MALE			FEMALE			MALE			FEMALE										
		FACTOR	REQ'D	PROVIDED	FACTOR	REQ'D	PROVIDED	FACTOR	REQ'D	PROVIDED	FACTOR	REQ'D	PROVIDED	FACTOR	REQ'D	PROVIDED	FACTOR	REQ'D	PROVIDED	REQ'D	PROVIDED
B	153	25	2.00	4	25	2.00	4	40	2.00	4	40	2.00	4	0	0.00	3	100	1.53	1	-	
		50	0.53		50	0.53		80	0.00		80	0.00									
S-1 and S-2	23	100	0.12		100	0.12		100	0.12		100	0.12		(P)411			1000	0.02		-	
TOTAL	**176**	**3**		**4**	**3**		**4**	**3**		**4**	**3**		**4**	**0**		**2**	**2**		**3**	**1**	**1**

OCCUPANCY LOAD

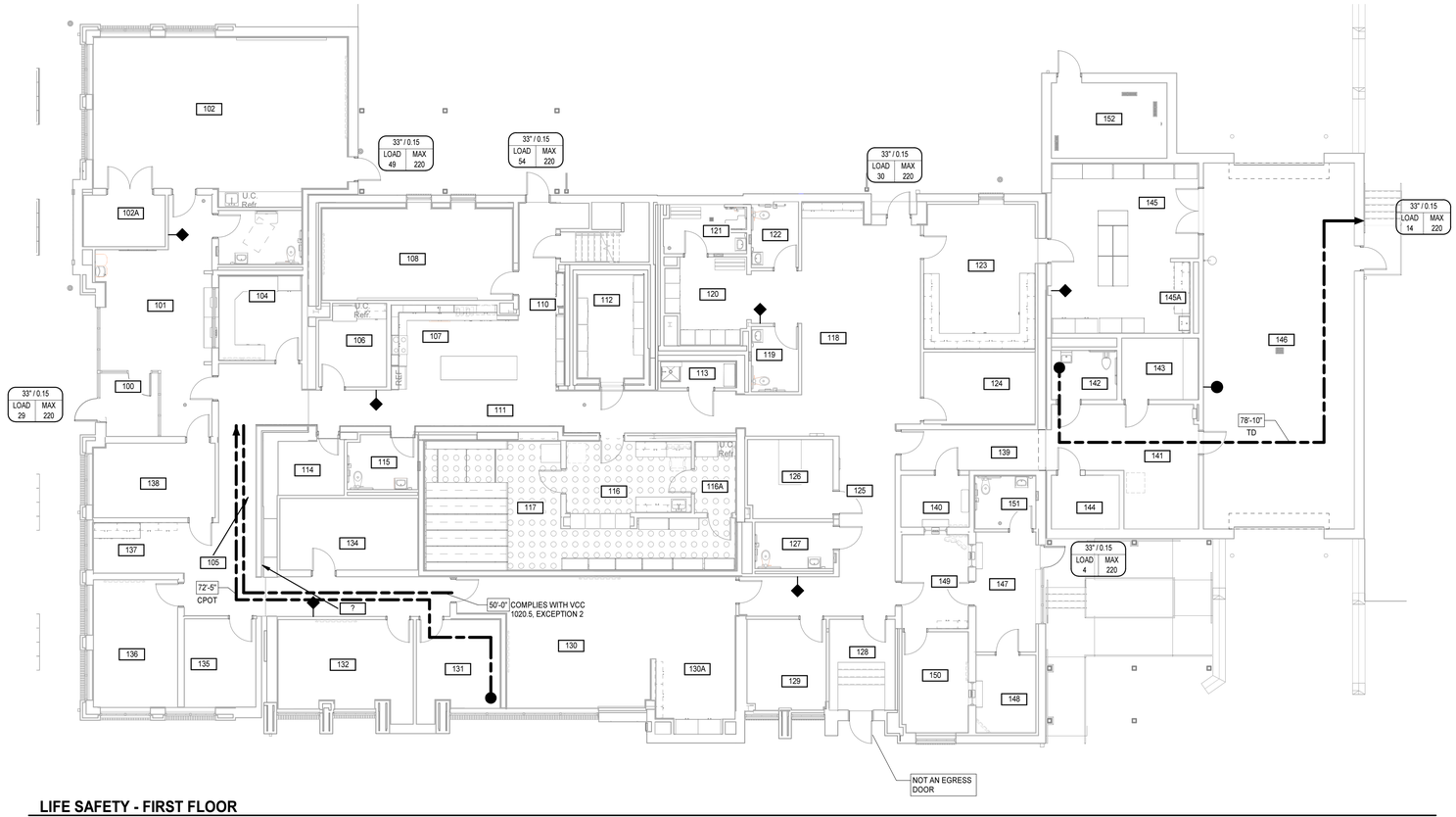
USE CLASSIFICATION	OCCUPANCY LOAD DESIGN
B	153
S1	1
S2	22
	176

OCCUPANCY SCHEDULE

SPACE NUMBER	SPACE NAME	USE CLASSIFICATION	USED TO DETERMINE OCCUPANCY FACTOR ONLY	FLOOR AREA PER OCCUPANT	AREA SF	AREA GROSS	AREA NET	OCCUPANCY LOAD TABULAR	OCCUPANCY LOAD ACTUAL	OCCUPANCY LOAD DESIGN
101	WAITING/ LOBBY	B	BUSINESS AREAS	150 SF	337	•		3		3
102	COMMUNITY ROOM	B	ASSEMBLY, UNCONCENTRATED	15 SF	708		•	48	30	48
102A	COMM STOR	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	75	•		1		1
104	RECEPTION	B	BUSINESS AREAS	150 SF	125	•		1		1
106	WELLNESS	B	BUSINESS AREAS	150 SF	96	•		1		1
107	KITCHEN/ BREAK	B	BUSINESS AREAS	150 SF	192	•		2	6	6
108	CONFERENCE	B	ASSEMBLY, UNCONCENTRATED	15 SF	316		•	22	12	22
112	GUN STORAGE	S1	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	121	•		1		1
113	JANITOR	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	35	•		1		1
114	EVIDENCE SUPPLY	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	66	•		1		1
116	EVIDENCE PROCESSING	B	BUSINESS AREAS	150 SF	160	•		2		2
116A	EVIDENCE STORAGE	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	52	•		1		1
117	EVIDENCE HOLDING	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	472	•		2		2
118	REPORT WRITING	B	BUSINESS, CONCENTRATED	50 SF	429	•		9	8	9
120	LOCKERS	S2	LOCKER ROOM	50 SF	114	•		3		3
123	SERGEANTS	B	BUSINESS, CONCENTRATED	50 SF	285	•		6	6	6
124	LIEUTENANT	B	BUSINESS AREAS	150 SF	142	•		1		1
126	INTERVIEW	B	BUSINESS, CONCENTRATED	50 SF	119	•		3	4	4
129	SECURE DATA	B	BUSINESS AREAS	150 SF	126	•		1		1
130	INVESTIGATORS, INVESTIGATIONS ADMIN ASSISTANT	B	BUSINESS, CONCENTRATED	50 SF	491	•		10	5	10
130A	FILES/PRINT	B	BUSINESS AREAS	150 SF	96	•		1		1
131	LIEUTENANT	B	BUSINESS AREAS	150 SF	134	•		1		1
132	DEPUTY CHIEF	B	BUSINESS AREAS	150 SF	215	•		2		2
134	POLICE ADMIN	B	BUSINESS AREAS	150 SF	175	•		2	1	2
135	ACCREDIDATION MANAGER	B	BUSINESS AREAS	150 SF	112	•		1		1
136	POLICE CHIEF	B	BUSINESS AREAS	150 SF	190	•		2	1	2
137	COPY	B	BUSINESS AREAS	150 SF	85	•		1		1
138	REPORT TAKING	B	BUSINESS AREAS	150 SF	160	•		2	6	6
140	HEARING	B	BUSINESS AREAS	150 SF	63	•		1		1
141	PROCESSING / BOOKING	B	BUSINESS AREAS	150 SF	252	•		2		2
143	INTOXILIZER	B	BUSINESS, CONCENTRATED	50 SF	84	•		2		2
144	HOLDING CELL	B	BUSINESS AREAS	150 SF	65	•		1		1
145	GENERAL STORAGE/ QUARTERMASTER	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	407	•		2		2
145A	GUN CLEANING	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	25	•		1		1
146	SALLYPORT	S2	PARKING GARAGE	200 SF	980	•		5		5
147	WAITING	B	BUSINESS AREAS	150 SF	127	•		1		1
148	HEARING	B	BUSINESS AREAS	150 SF	83	•		1		1
149	MAGISTRATE	B	BUSINESS AREAS	150 SF	111	•		1		1
150	CHIEF MAGISTRATE	B	BUSINESS AREAS	150 SF	119	•		1		1
152	MECHANICAL	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	154	•		1		1
201	DATA	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	70	•		1		1
202	LAUNDRY	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	54	•		1		1
204	FUTURE GROWTH AREA	B	BUSINESS, CONCENTRATED	50 SF	632	•		13		13
206	STORAGE	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	142	•		1		1
207	ELECTRICAL	S2	ACCESSORY STORAGE & MECHANICAL EQUIPMENT ROOM	300 SF	210	•		1		1
										176



LIFE SAFETY - SECOND FLOOR
1/8" = 1'-0"



LIFE SAFETY - FIRST FLOOR
1/8" = 1'-0"

BUILDING - 1 DATA

PRIMARY OCCUPANCY CLASSIFICATION & USE GROUP:	Business: B				
CONSTRUCTION TYPE:	II-B				
FULLY SPRINKLERED | TYPE:	YES	NFPA 13	**ALLOWABLE AREA FACTOR BASED ON:**	SM	
MIXED OCCUPANCY:	YES				
NON-SEPARATED MIXED USE:	YES	**DESIGN OCCUPANCY CLASSIFICATION:**	Business: B		
SEPARATED MIXED USE:	NO				

BUILDING HEIGHT IN FEET ABOVE GRADE PLANE - TABULAR (TABLE 504.3)	BUILDING HEIGHT IN FEET (ACTUAL)	ALLOWABLE LARGER THAN ACTUAL	ALLOWABLE STORIES ABOVE GRADE PLANE - TABULAR (TABLE 504.4)	STORIES ABOVE GRADE PLANE (ACTUAL)	ALLOWABLE LARGER THAN ACTUAL
75	26	YES	3	2	YES

BUILDING FRONTAGE INCREASE TABULATIONS (506.3)	PERCENTAGE OF PERIMETER ON A PUBLIC WAY OR OPEN SPACE	SMALLEST PUBLIC WAY OR OPEN SPACE (20 feet or greater)	FACTOR FOR AREA INCREASE FOR FRONTAGE - I_f (Table 506.3.3)	"NS" TABULAR AREA PER TABLE 506.2	FRONTAGE INCREASE (SF)
	0 to less than 25	0 to less than 20	0.00	9,500	0

STORY LEVEL	TABULAR ALLOWABLE AREA (TABLE 506.2)	FRONTAGE INCREASE (SF)	ALLOWABLE AREA PER STORY (SF)	BUILDING AREA PER STORY (ACTUAL SF)	ALLOWABLE LARGER THAN ACTUAL
STORY 1	28,500	0	28,500	12,432	YES
STORY 2	28,500	0	28,500	1,734	YES
TOTAL BUILDING AREA DETERMINATION:			Two-Story; Allowable times 2		
ALLOWABLE BUILDING AREA			57,000		
TOTAL BUILDING AREA				14,166	YES

FIRE RESISTANCE RATING OF BUILDING ELEMENTS
BUILDING - 1

CONSTRUCTION TYPE:	**II-B**
BUILDING ELEMENT	**REQUIRED RATING**
PER TABLE 601	
PRIMARY STRUCTURAL FRAME	0 HRS
EXTERIOR BEARING WALLS	0 HRS
INTERIOR BEARING WALLS	0 HRS
EXTERIOR NONBEARING WALLS AND PARTITIONS	0 HRS
INTERIOR NONBEARING WALLS AND PARTITIONS	0 HRS
FLOOR CONSTRUCTION & ASSOCIATED SECONDARY MEMBERS	0 HRS
ROOF CONSTRUCTION & ASSOCIATED SECONDARY MEMBERS	0 HRS
PER CHAPTER 7	
FIRE WALLS	0 HRS
FIRE BARRIERS	0 HRS
SHAFT ENCLOSURES (Less than 4 stories)	0 HRS
SHAFT ENCLOSURES (4 or more stories)	0 HRS
EXIT ENCLOSURES (Less than 4 stories)	0 HRS
EXIT ENCLOSURES (4 or more stories)	0 HRS
FIRE PARTITIONS	0 HRS
SMOKE BARRIERS	0 HRS
SMOKE PARTITIONS	0 HRS
CORRIDORS	0 HRS
HORIZONTAL ASSEMBLIES	0 HRS
EXTERIOR WALLS (based on fire separation distance per Table 705.5)	
less than 5 feet	0 HRS
5 or more feet < 10 feet	0 HRS
10 or more feet < 30 feet	0 HRS
30 or more feet	0 HRS

LIFE SAFETY SYMBOL LEGEND
APPLIES TO G1.1.X SERIES OF DRAWINGS ONLY

SYMBOLS

- 1205 — ROOM NUMBER
- 120 — MINIMUM FIRE DOOR / SHUTTER / WINDOW RATING IN MINUTES
- NXX / NXX — WALL RATING; ADDITIONAL WALL RATING, WHERE OCCURS
- EX NXX / EX NXX — EXISTING WALL RATING; ADDITIONAL EXISTING WALL RATING, WHERE OCCURS
- 33" / 0.2 LOAD 100 MAX 165 — CLEAR WIDTH OF EGRESS; MEANS OF EGRESS CAPACITY FACTOR; AVAILABLE OCCUPANT LOAD CAPACITY; OCCUPANT LOAD SERVED
- nnn'-n" TD — EXIT ACCESS TRAVEL DISTANCE
- nn'-n" CPOT — COMMON PATH OF TRAVEL
- FIRE EXTINGUISHER CABINET
- FIRE EXTINGUISHER BRACKET

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3200 NORFOLK STREET, RICHMOND, VA 23230
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MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

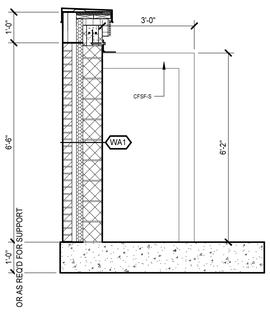
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

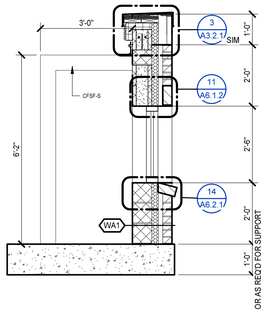
LIFE SAFETY PLAN

G1.1.1

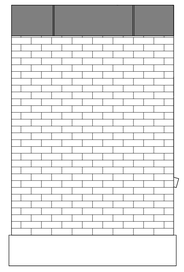
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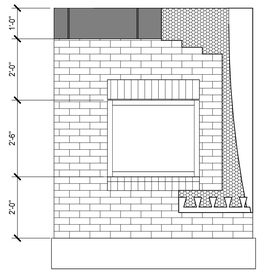
5 G3.1.1 G3.1.1 **MOCK UP PANEL WALL SECTION** 1/2" = 1'-0"



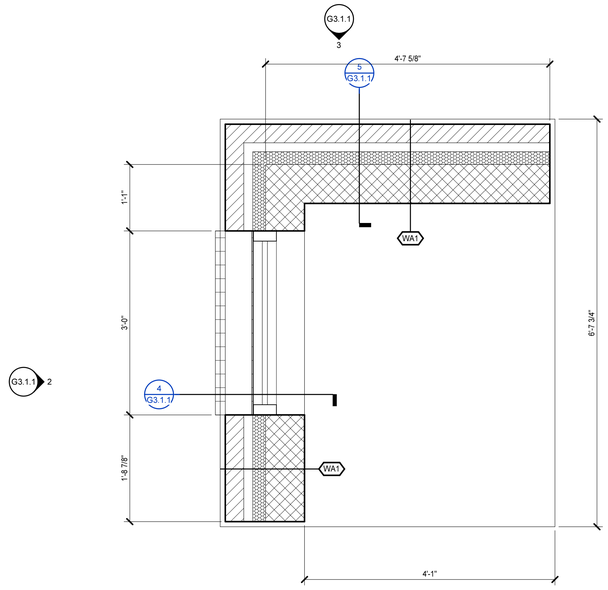
4 G3.1.1 G3.1.1 **MOCK UP PANEL WALL SECTION** 1/2" = 1'-0"



3 G3.1.1 G3.1.1 **MOCK UP PANEL ELEVATION** 1/2" = 1'-0"



2 G3.1.1 G3.1.1 **MOCK UP PANEL ELEVATION** 1/2" = 1'-0"



G3.1.1 2

1 A0.2.2 G3.1.1 **MOCK UP PANEL FLOOR PLAN** 1" = 1'-0"

THE EXTERIOR INTEGRATED MOCKUP PANEL DRAWINGS ARE CONCEPTUAL IN NATURE AND COMPLEMENTARY TO OTHER RELATED DRAWINGS AND DETAILS. USE EXTERIOR INTEGRATED MOCKUP PANEL TO DEMONSTRATE AN UNDERSTANDING OF THE MATERIAL INTEGRATION, SEQUENCING, AND PROCESSES REQUIRED TO COORDINATE THESE COMPONENTS AND BUILDING EXTERIOR WALL ASSEMBLY.

REFER TO RELATED AND REFERENCED DETAIL, SECTIONS, WALL ASSEMBLIES, AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.

CONSTRUCT IN "STEPPED BACK" METHOD AS SHOWN. LEAVE AND PROTECT INDICATED MATERIALS EXPOSED UNTIL PANEL IS DEMOLISHED.

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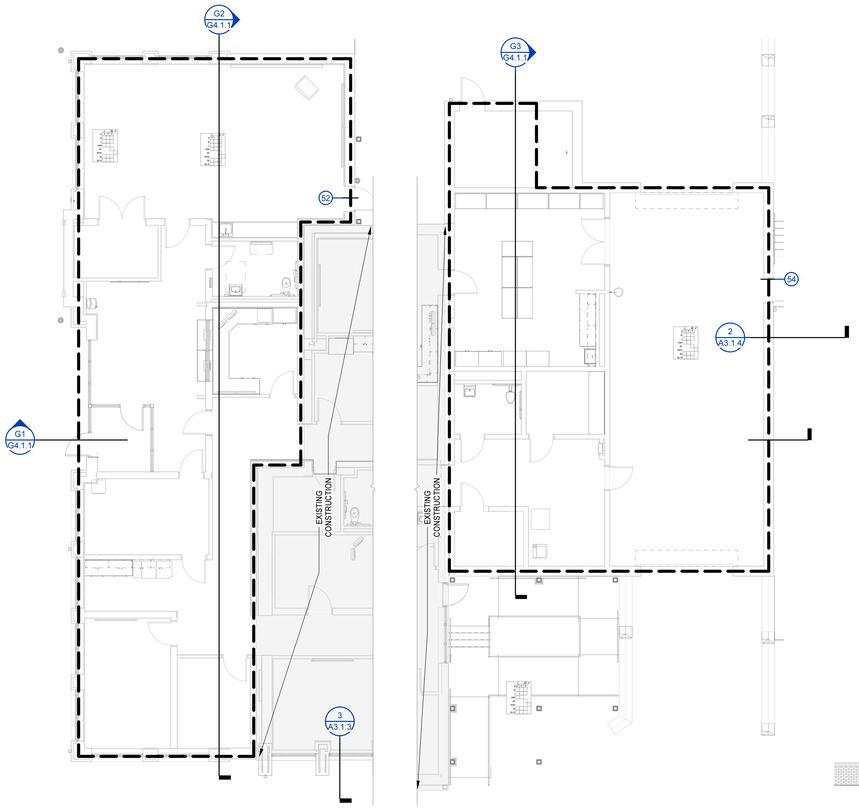
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
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REVISIONS	
DATE	DESCRIPTION

INTEGRATED MOCKUP PANEL

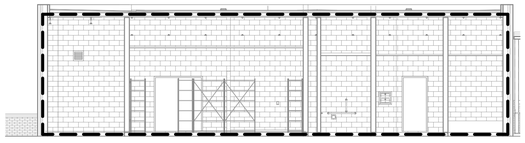
G3.1.1

11/2/2026 1:02:51 PM



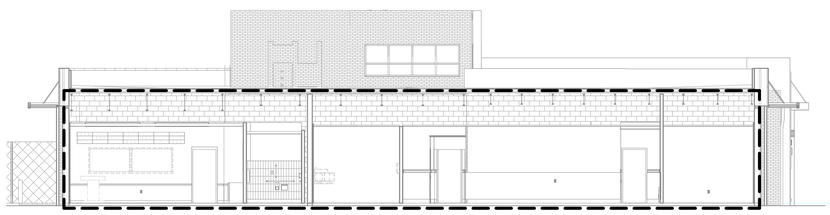
AIR BARRIER DIAGRAM

1/8" = 1'-0"



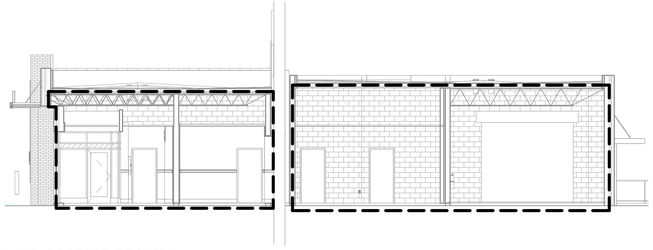
G3 AIR BARRIER SECTION

G4.1.1 G4.1.1 1/8" = 1'-0"



G2 AIR BARRIER SECTION

G4.1.1 G4.1.1 1/8" = 1'-0"



G1 AIR BARRIER SECTION

G4.1.1 G4.1.1 1/8" = 1'-0"

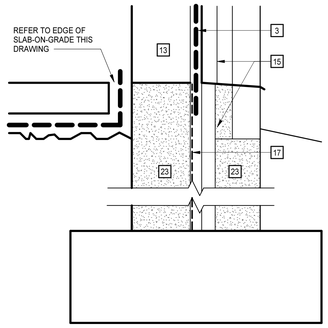
FLOOR PLAN/BUILDING SECTION LEGEND

EXTENT OF AIR BARRIER MEMBRANE / MATERIAL / SYSTEM AND EXTERIOR BUILDING ENVELOPE ENCLOSURE

THIS DRAWING DEPICTS THE EXTENT OF THE AIR BARRIER MEMBRANE / MATERIAL / SYSTEM AND EXTERIOR BUILDING ENVELOPE ENCLOSURE. THE DRAWING IS CONCEPTUAL IN NATURE AND IS COMPLEMENTARY TO OTHER AIR BARRIER AND BUILDING ENVELOPE ENCLOSURE DETAILS, SECTIONS, ASSEMBLIES, AND SPECIFICATIONS.

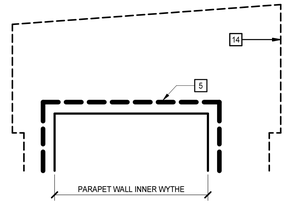
THE UNDERSLAB VAPOR / AIR BARRIER MATERIAL IN ASSOCIATION WITH THE AIR BARRIER MEMBRANE / MATERIAL ON THE WALLS AND ROOF COMPOSE THE EXTERIOR BUILDING ENVELOPE ENCLOSURE TO PREVENT AIR INFILTRATION AND EXFILTRATION.

THE EXTERIOR BUILDING ENVELOPE ENCLOSURE MAY EXTEND WITHIN EXTERIOR WALLS WHERE THE INTERIOR AND EXTERIOR ENVIRONMENTS ARE NOT SEPARATED (E.G., MECHANICAL AND ELECTRICAL ROOMS, STAIRS, ELEVATORS, AND SIMILAR UNCONDITIONED SPACES). IN SUCH AREAS, MAINTAIN AIR BARRIER CONTINUITY AT THE PARTITIONS SEPARATING THEM FROM CONDITIONED SPACES, SEALING ALL PENETRATIONS, VOIDS, AND GAPS FROM FLOOR TO DECK ABOVE. WHERE SUCH AREAS HAVE PAINTED MASONRY PARTITIONS WITH ADJACENT, SUSPENDED CEILINGS, CONTINUE PAINT FINISH ABOVE CEILINGS FULL HEIGHT TO DECK.



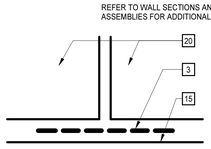
FOOTING/FOUNDATION

NO SCALE — REFER TO WALL SECTIONS, WALL ASSEMBLIES, AND BASE OF WALL DETAIL FOR ADDITIONAL INFORMATION

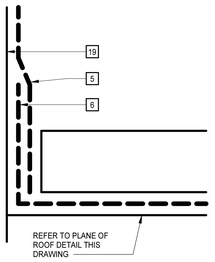


PARAPET

NO SCALE

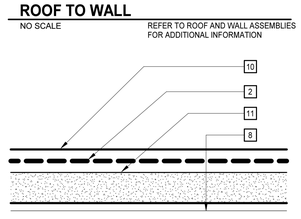


PLAN OR SECTION VIEW



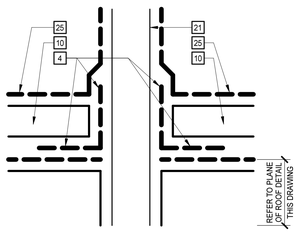
DISSIMILAR MATERIALS

NO SCALE



ROOF TO WALL

NO SCALE — REFER TO ROOF AND WALL ASSEMBLIES FOR ADDITIONAL INFORMATION

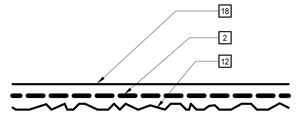


PLANE OF ROOF

NO SCALE — REFER TO ROOF ASSEMBLIES FOR ADDITIONAL INFORMATION

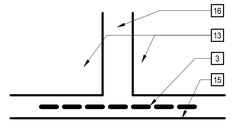
ROOF PENETRATIONS

NO SCALE — REFER TO ROOF ASSEMBLIES FOR ADDITIONAL INFORMATION



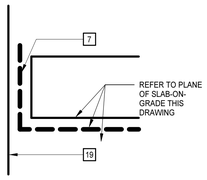
PLANE OF SLAB-ON-GRADE

NO SCALE



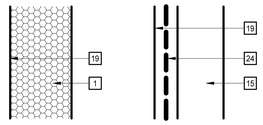
EXTERIOR WALL JOINTS

NO SCALE — REFER TO WALL ASSEMBLIES AND JOINT TYPES FOR ADDITIONAL INFORMATION



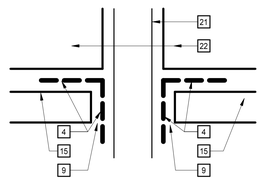
EDGE OF SLAB-ON-GRADE

NO SCALE — REFER TO SLAB-ON-GRADE BOUNDARY CONDITIONS FOR ADDITIONAL INFORMATION



PLANE OF EXTERIOR WALL

NO SCALE — REFER TO WALL ASSEMBLIES FOR ADDITIONAL INFORMATION



WALL PENETRATIONS

NO SCALE

AIR BARRIER KEYNOTES

REPRESENTED BY n

APPLIES TO THIS DRAWING

1	SPF AIR BARRIER
2	VAPOR/AIR BARRIER MEMBRANE
3	AIR BARRIER TRANSITION STRIP
4	AIR BARRIER TRANSITION STRIP AROUND ENTIRE PENETRATION
5	AIR BARRIER MEMBRANE - LAP AND CONTINUE UP AND OVER PARAPET
6	VAPOR/AIR BARRIER MEMBRANE - TURN UP, PROVIDE CONTINUOUS AIR-TIGHT SEAL AND ADHERE TO WALL AND TERMINATE PER MFR INSTRUCTIONS
7	VAPOR/AIR BARRIER MEMBRANE - EXTEND UP FACE OF WALL, PROVIDE CONTINUOUS AIR-TIGHT SEAL AND ADHERE TO WALL, THEN CUT OFF FLUSH WITH TOP OF SLAB
8	STEEL ROOF DECK
9	FULLY SEAL BETWEEN INSULATION AND PENETRATION ITEM
10	ROOF INSULATION
11	SUBSTRATE BOARD
12	POROUS FILL
13	EXTERIOR WALL INNER WYTHE
14	COPING - OUTLINE MAY VARY
15	CAVITY INSULATION
16	JOINT WIDTH VARIES
17	DAMPPROOFING
18	SLAB-ON-GRADE
19	FACE OF WALL, SHEATHING OR VERTICAL ELEMENT
20	DISSIMILAR MATERIALS
21	PENETRATING ITEM
22	MATERIAL OR WALL BEING PENETRATED
23	GROUTED SOLID MASONRY - SERVES AS AIR BARRIER
24	AIR BARRIER SYSTEM
25	ROOF MEMBRANE

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3200 NORFOLK STREET, RICHMOND, VA 23230
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COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

GENERAL INFORMATION - AIR BARRIER

G4.1.1

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SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL, VIRGINIA

LEGEND

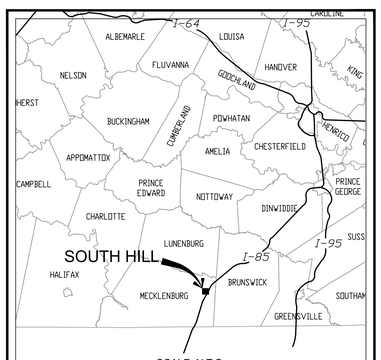
EXISTING		PROPOSED
SS	SANITARY SEWER	??" SS
WL	WATERLINE	??" WL
FM	FORCEMAIN	??" FM
	STORM SEWER	
	GAS LINE	??" G
UG ??	UNDERGROUND UTILITY	UG ??
OHP	OVERHEAD POWER	OHP
	TREE LINE	
	FENCE	
	GUARD RAIL	
	PROPERTY LINE	
	EASEMENT	
230	GROUND CONTOUR	230
	FLOW LINE	
	EDGE OF PAVEMENT / CONCRETE	
	GRAVEL	
	CURB	
	CURB & GUTER	
	REVERSE CURB & GUTER	
	ASPHALT	
	LIGHT DUTY ASPHALT	
	STANDARD DUTY ASPHALT	
	HEAVY DUTY ASPHALT	
	MILL AND OVERLAY	
	CONCRETE	
	LIGHT DUTY CONCRETE	
	MEDIUM DUTY CONCRETE	
	HEAVY DUTY CONCRETE	
	RIP RAP	
	STRUCTURE	
	POWER / UTILITY POLE	
	LIGHT POLE	
	TRANSFORMER	
	POST / POLE MOUNTED SIGN	
	FIRE HYDRANT	
	WATER VALVE	
	WATER METER	
	AIR RELEASE VALVE	
	MANHOLE	
	CLEAN OUT	
	TELEPHONE PEDESTAL	
	LIMITS OF DISTURBANCE	
	BENCHMARK	
	FINISH GRADE ELEVATION	401.26
	FINISH GRADE ELEVATION OF CURB	TOP OF CURB 401.26, BOTTOM OF CURB 400.76, ELEVATION POINT
	STORM SEWER LABEL	B-3
	SANITARY SEWER LABEL	B-3

ABBREVIATIONS

ALT	ALTERNATE	MH	MANHOLE
ARV	AIR RELEASE VALVE	MIN	MINIMUM
ASPH	ASPHALT	MISC	MISCELLANEOUS
AVG	AVERAGE	N.T.S.	NOT TO SCALE
BC	BOTTOM OF CURB	OHP	OVER HEAD POWER
BM	BENCHMARK	P&A	PLUGGED & ABANDONED
B.O.W.	BOTTOM OF WALL	PERM	PERMANENT
C&G	CURB & GUTTER	PL or ℄	PROPERTY LINE
CL or ℄	CENTERLINE	PP	POWER POLE
CJ or ⊄	CONTROL JOINT	PREFAB	PREFABRICATED
C.O.	CLEAN OUT	PROP	PROPOSED
CONC	CONCRETE	QTY	QUANTITY
CONST	CONSTRUCT	R	RADIUS
DEMO	DEMOLISH OR DEMOLITION	RCP	REINFORCED CONCRETE PIPE
DIA. DI	DROP INLET	REF	REFERENCE
or Ø	DIAMETER	REQ'D	REQUIRED
D.I.P.	DUCTILE IRON	REV.	REVISION
EA	EACH	R/W	RIGHT OF WAY
EG	EDGE OF GRAVEL	SIM.	SIMILAR
ELE	ELECTRIC	SPECS	SPECIFICATIONS
ELEV	ELEVATION	SS	SANITARY SEWER
EJ	EXPANSION JOINT	STM	STORM SEWER
EP	EDGE OF PAVEMENT	STD	STANDARD
EQ	EQUAL	SW	SIDEWALK
EQUIP.	EQUIPMENT	T.B.A.	TO BE ABANDONED
ESMT	EASEMENT	T.B.R.	TO BE REMOVED
EST	ESTIMATE	T.C.	TERRA COTTA
EX	EXISTING	TC	TOP OF CURB
FF	FINISH FLOOR	TELE	TELEPHONE
FHYD	FIRE HYDRANT	TEMP	TEMPORARY
FL	FLOW LINE	THRU	THROUGH
FO	FIBER OPTIC	TP	TELEPHONE PEDESTAL
FOP	FIBER OPTIC PEDESTAL	T.O.W.	TOP OF WALL
GVL	GRAVEL	TYP	TYPICAL
GW	GUIDE WIRE	UG	UNDERGROUND
HOR	HORIZONTAL	UP	UTILITY POLE
H.P.	HIGH POINT	VERT	VERTICAL
LAT	LATERAL	V.I.F.	VERIFY IN FIELD
L.P.	LOW POINT	WL	WATERLINE
LP	LIGHT POLE	W/	WITH
MAX	MAXIMUM	W/O	WITHOUT
MFR	MANUFACTURER	WM	WATERMETER
		WV	WATER VALVE

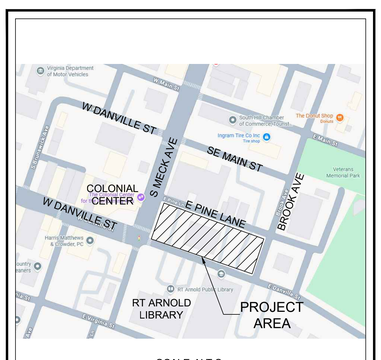
SHEET INDEX

C-0.0	CIVIL COVER SHEET
C-1.0	MASTER PLAN
C-1.1	EXISTING CONDITIONS & DEMOLITION PLAN
C-1.2	LAYOUT PLAN
C-1.3	UTILITY PLAN
C-1.4	GRADING & DRAINAGE PLAN
C-2.1	CONSTRUCTION DETAILS
C-2.2	UTILITY DETAILS
C-3.1	E&S CONTROL NARRATIVE & DETAILS
C-3.2	E&S CONTROL PLAN
C-4.1	DRAINAGE DIVIDE MAPS
C-5.1	MOT/TTC PLAN



SCALE: N.T.S.

GENERAL VICINITY MAP



SCALE: N.T.S.

LOCATION MAP

PROJECT INFORMATION

OWNER:

NAME: TOWN OF SOUTH HILL

CONTACT: KELI REEKES, TOWN MANAGER
PHONE: 434-447-3191

ADDRESS: 211 SOUTH MECKLENBURG AVENUE,
SOUTH HILL, VIRGINIA 23970

ENGINEER / AGENT:

NAME: B&B CONSULTANTS, INC.

CONTACT: SAMUEL CARROLL, P.E.

ADDRESS: 212 E. FERRELL STREET
SOUTH HILL, VIRGINIA 23970

PHONE: (434) 447-7621

FAX: (434) 447-4257

EMAIL: SCARROLL@BANDBCONS.COM

PROPERTY:

PRN: 23377, 23379, 23380, & 23378

TOTAL PARCEL ACREAGE: 0.70 ACRES

ZONING: C3

USE: MUNICIPAL

SITE:

ADDRESS: 211 SOUTH MECKLENBURG AVENUE,
SOUTH HILL, VIRGINIA 23970

PARKING REQUIRED: 30 SPACES

PARKING PROVIDED: 44 TOTAL (1 HANDICAP)

WATER: MUNICIPAL

SEWER: MUNICIPAL

EXISTING BUILDING AREA: 7,243 sqft

PROPOSED BUILDING ADDITION AREA: 5,108 sqft (total)

TOTAL BUILDING AREA: 12,351 sqft

NO. OF STORIES: 1 STORY & PARTIAL 2 STORY

GENERAL NOTES

EXISTING UTILITY NOTES:

MISS UTILITY

THE CONTRACTOR SHALL NOTIFY "MISS UTILITY" 48 HOURS PRIOR TO THE START OF EXCAVATION. CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF ALL UNDERGROUND UTILITIES SHOWN ON PLANS IN AREAS OF CONSTRUCTION PRIOR TO STARTING WORK. CONTACT THE ENGINEER IMMEDIATELY IF THE LOCATION OR ELEVATION IS DIFFERENT FROM THAT SHOWN ON THE PLAN, IF THERE APPEARS TO BE A CONFLICT, AND/OR UPON DISCOVERY OF ANY UTILITY NOT SHOWN ON PLAN. "MISS UTILITY" VIRGINIA OFFICE 1-800-552-7001.

1. THE LOCATION OF EXISTING UTILITIES ACROSS OR ALONG THE LINE OF PROPOSED WORK ARE NOT NECESSARILY SHOWN ON THE PLANS AND WHERE SHOWN ARE ONLY APPROXIMATELY CORRECT. THE CONTRACTOR SHALL ON HIS OWN INITIATIVE AND AT NO EXTRA COST, LOCATE ALL UNDERGROUND LINES AND STRUCTURES AS NECESSARY. NO CLAIMS OF DAMAGE OR COMPENSATION SHALL OCCUR TO THE CONTRACTOR FROM THE PRESENCE OF SUCH PIPES OR OTHER OBSTRUCTIONS OR FROM ANY DELAY DUE TO REMOVAL OR REARRANGEMENT OF SAME. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO UNDERGROUND UTILITIES AND/OR STRUCTURES AND COOPERATE FULLY WITH UTILITY COMPANIES INVOLVED..

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL ACQUIRE ANY AND ALL NECESSARY CONSTRUCTION PERMITS.
2. CONTRACTOR SHALL REMOVE ALL DEMOLISHED MATERIALS (BUILDINGS, PAVEMENT, ETC.), CLEARED VEGETATION, AND EXCESS SOIL FROM SITE AND DISPOSED OF LEGALLY AND PROPERLY.
3. CONSTRUCTION STAKING SHALL BE DONE ONLY BY A LICENSED LAND SURVEYOR.
4. THE CONTRACTOR SHALL NOTIFY AND COORDINATE WITH ALL UTILITY COMPANIES FOR PROPOSED SERVICE CONNECTIONS.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

B&B Consultants, Inc.
Engineers-Planners
Surveyors-Lab Analysts

COMMONWEALTH OF VIRGINIA
SAMUEL PATRICK CARROLL
Lic. No. 046622
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

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111 E. DANVILLE STREET, SOUTH HILL, VA 23970

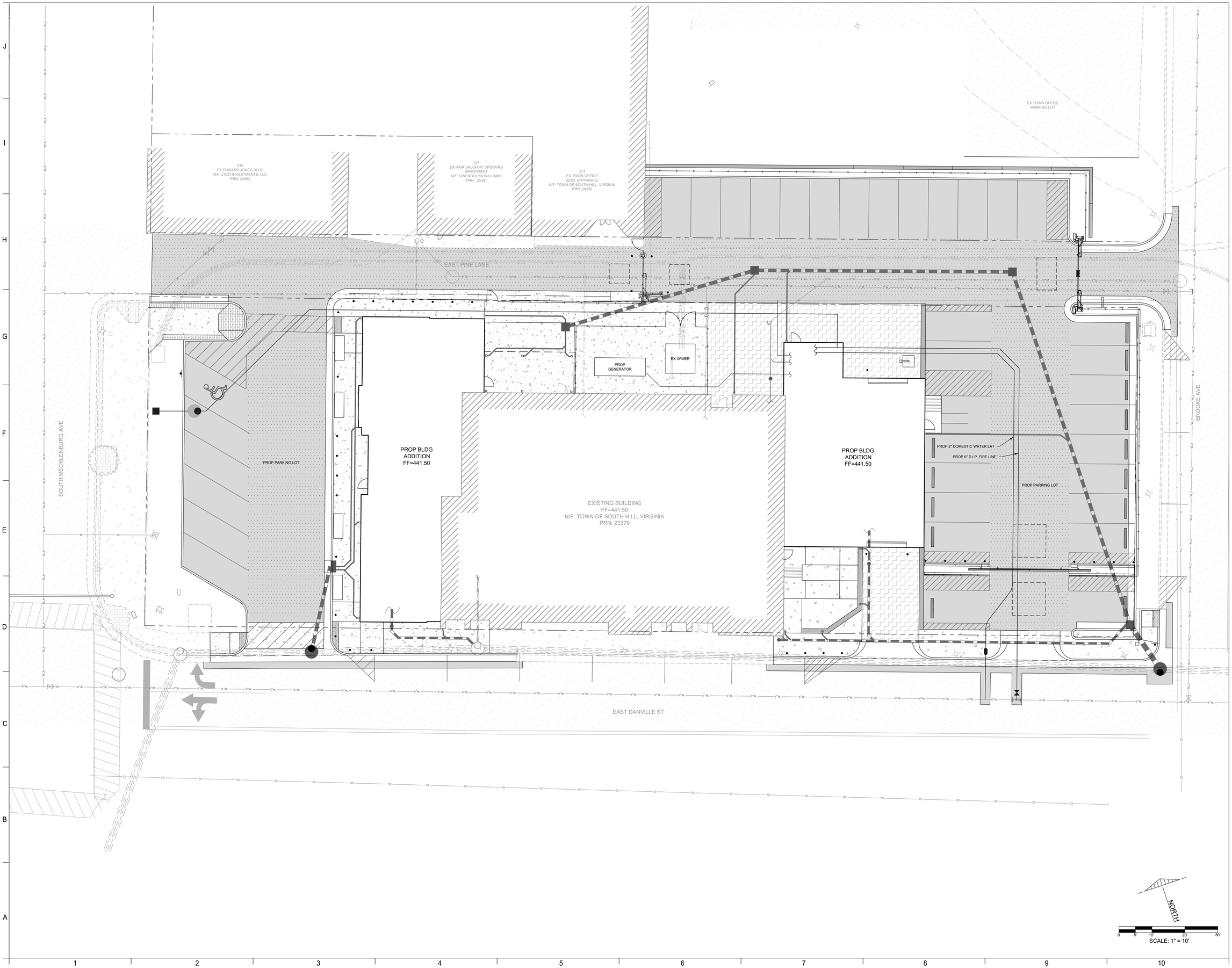
PROJECT NO: 651033 DATE: OCTOBER 21, 2026

SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

CIVIL COVER SHEET

C-0.0



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PHONE (804) 794-7555
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Engineers-Planners
Surveyors-Lab Analysts

COMMONWEALTH OF VIRGINIA
SAMUEL PATRICK CARROLL
Lic. No. 046622
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

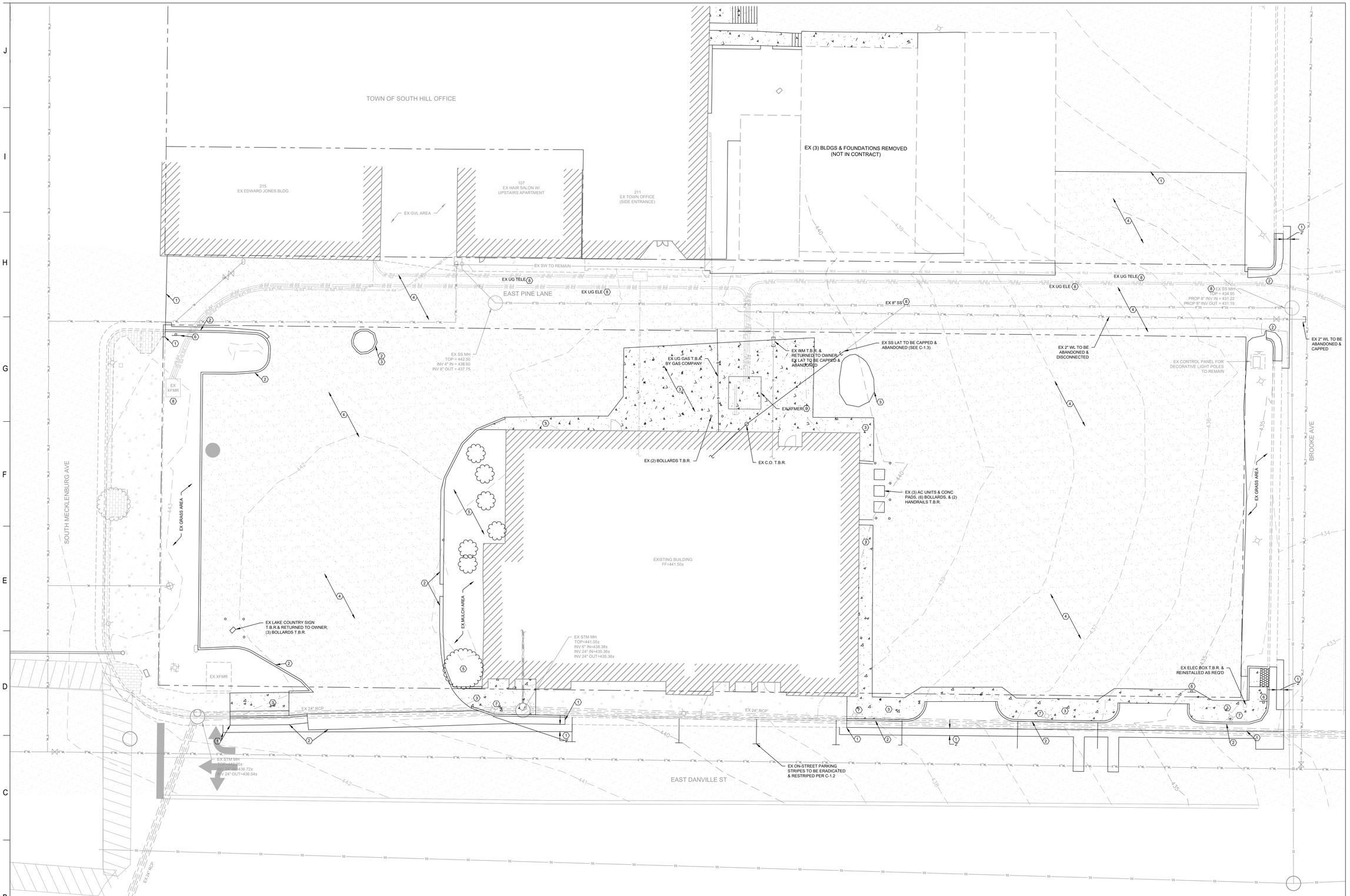
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MASTER PLAN

C-1.0



DEMOLITION PLAN NOTES

1. PROP SAWCUT
2. EX CURB/GUTTER T.B.R.
3. EX CONC T.B.R.
4. EX ASPH LOT TO BE SAWCUT & REMOVED
5. EX TREES/SHRUBS/LANDSCAPING T.B.R.
6. EX SIGN T.B.R. & REPLACED AS REQ'D
7. EX DECORATIVE LP TO BE TEMPORARILY REMOVED FOR CONSTRUCTION, REINSTALLED, & MOUNTING HEIGHT TO BE ADJUSTED AS REQ'D FOR PROP SW
8. EX UTILITY INSTALLED PRIOR TO THIS PROJECT. LOCATION & ELEVATIONS ARE PER DESIGN & NOT AS-BUILT. CONTRACTOR TO VERIFY. NO CONFLICTS OR REPORT ANY CONFLICTS TO ENGINEER PRIOR TO START OF CONSTRUCTION.

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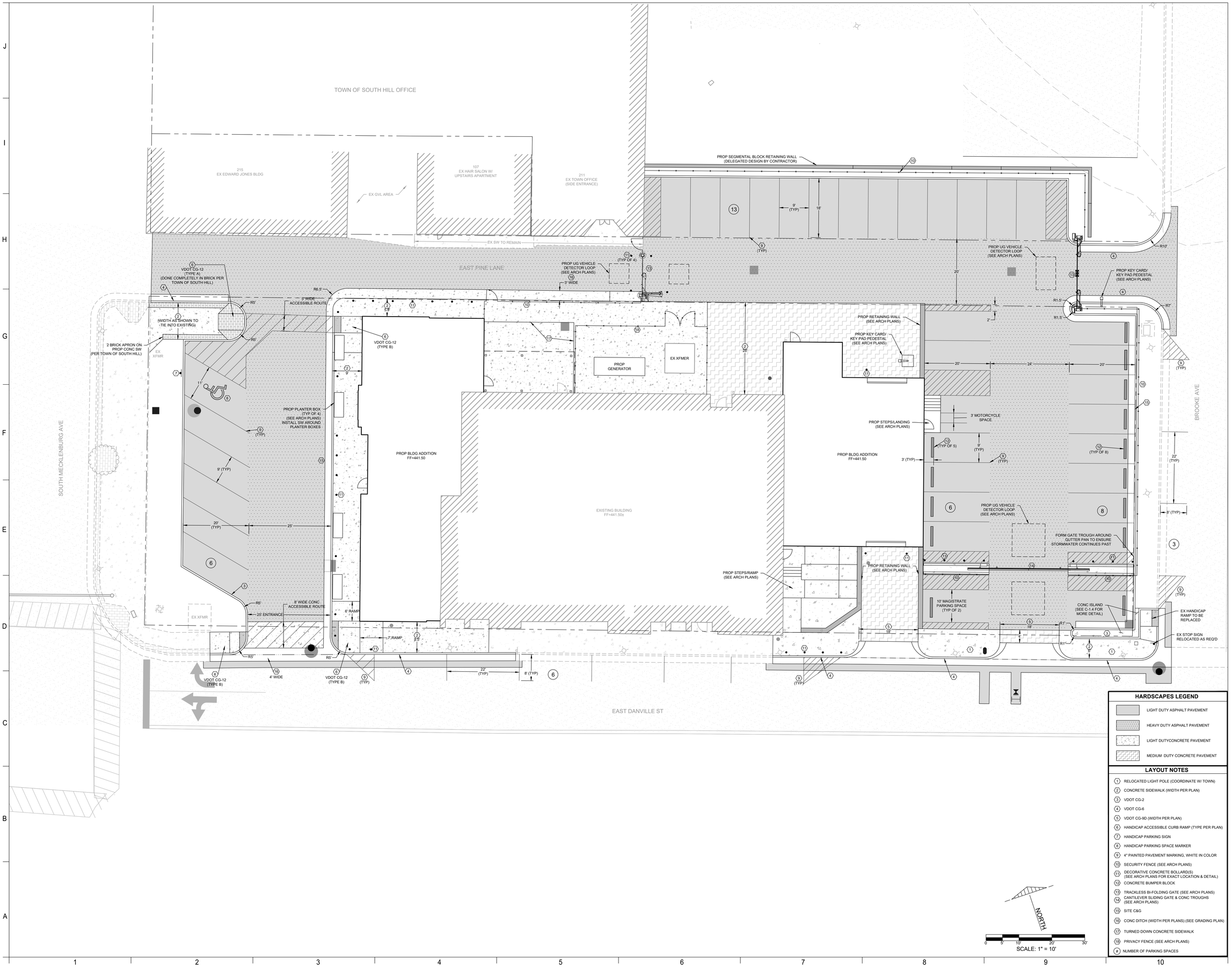
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EXISTING CONDITIONS & DEMOLITION PLAN

C-1.1



HARDSCAPES LEGEND

- LIGHT DUTY ASPHALT PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTYCONCRETE PAVEMENT
- MEDIUM DUTY CONCRETE PAVEMENT

LAYOUT NOTES

1. RELOCATED LIGHT POLE (COORDINATE W/ TOWN)
2. CONCRETE SIDEWALK (WIDTH PER PLAN)
3. VDOT CG-2
4. VDOT CG-6
5. VDOT CG-9D (WIDTH PER PLAN)
6. HANDICAP ACCESSIBLE CURB RAMP (TYPE PER PLAN)
7. HANDICAP PARKING SIGN
8. HANDICAP PARKING SPACE MARKER
9. 4" PAINTED PAVEMENT MARKING, WHITE IN COLOR
10. SECURITY FENCE (SEE ARCH PLANS)
11. DECORATIVE CONCRETE BOLLARD(S) (SEE ARCH PLANS FOR EXACT LOCATION & DETAIL)
12. CONCRETE BUMPER BLOCK
13. TRACKLESS BI-FOLDING GATE (SEE ARCH PLANS)
14. CANTILEVER SLIDING GATE & CONC TROUGHS (SEE ARCH PLANS)
15. SITE C&G
16. CONC DITCH (WIDTH PER PLANS) (SEE GRADING PLAN)
17. TURNED DOWN CONCRETE SIDEWALK
18. PRIVACY FENCE (SEE ARCH PLANS)

(#) NUMBER OF PARKING SPACES

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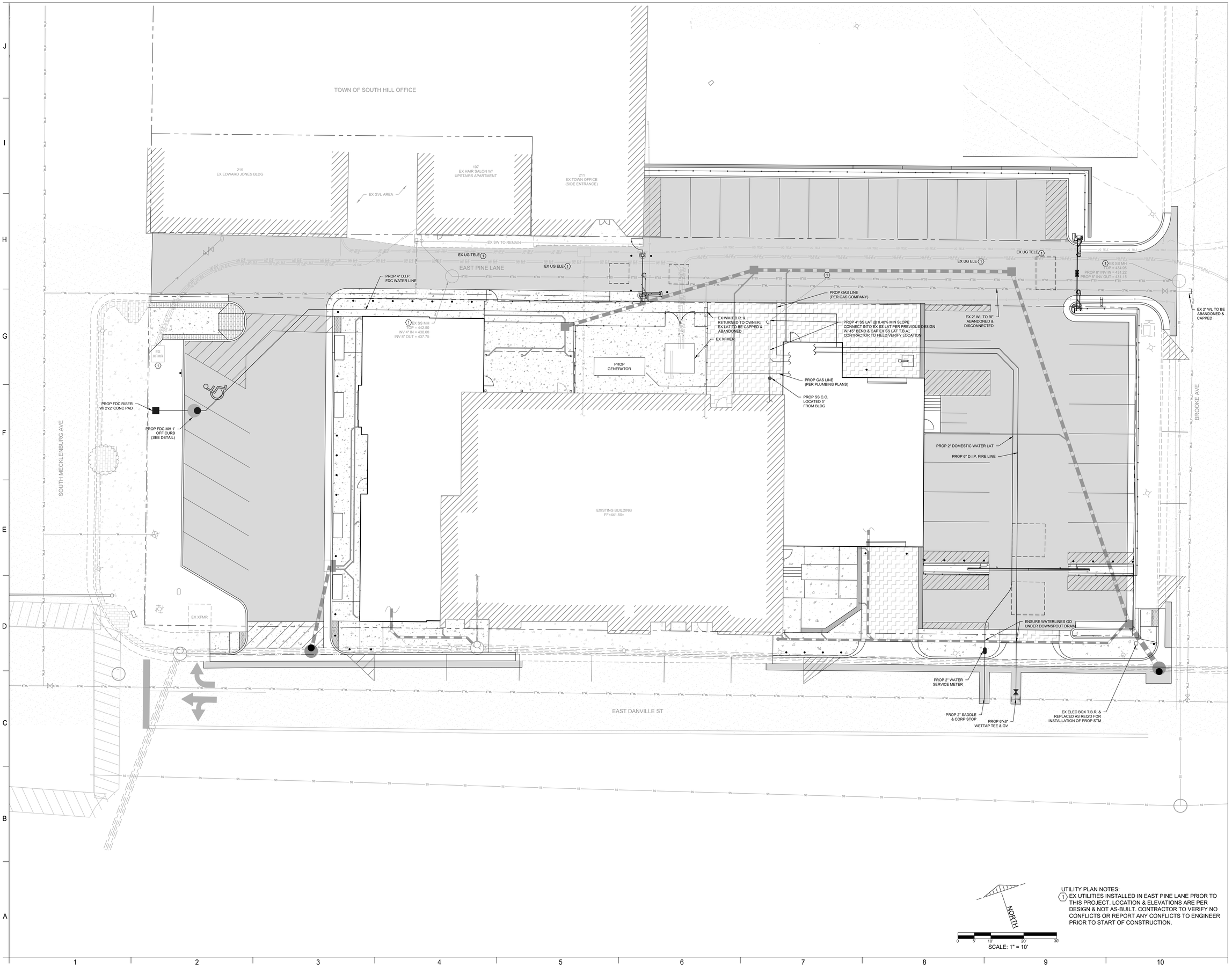
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LAYOUT PLAN

C-1.2



UTILITY PLAN NOTES:

1 EX UTILITIES INSTALLED IN EAST PINE LANE PRIOR TO THIS PROJECT. LOCATION & ELEVATIONS ARE PER DESIGN & NOT AS-BUILT. CONTRACTOR TO VERIFY NO CONFLICTS OR REPORT ANY CONFLICTS TO ENGINEER PRIOR TO START OF CONSTRUCTION.

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UTILITY PLAN

C-1.3

TOWN OF SOUTH HILL OFFICE

215
EX EDWARD JONES BLDG

107
EX HAIR SALON W/
UPSTAIRS APARTMENT

211
EX TOWN OFFICE
(SIDE ENTRANCE)

EX GVL AREA

EX SW TO REMAIN

EAST PINE LANE

EAST DANVILLE ST

SOUTH MECKLENBURG AVE

BROOKE AVE

EXISTING BUILDING
FF=441.50±

ELEV MATCH EX

PROP DOWNSPOUT CONNECTION (TYP) (SEE ARCH PLANS)

PROP PLANTER BOX (TYP OF 4) (SEE ARCH PLANS) SET PLANTERS LEVEL & INSTALL SW AROUND PLANTER BOXES

PROP 4"Ø SCH-40 PVC FOUNDATION DRAIN LATERAL, 0.5% MIN SLOPE, PROVIDE FITTINGS AS REQ'D (TYP) FOUNDATION DRAIN TO BE **SEPARATE** OF THE DOWNSPOUT PIPING (SEE ARCH PLANS FOR DRAIN ALONG BLDG)

PROP 4"Ø SCH-40 PVC FOUNDATION DRAIN LATERAL, 0.5% MIN SLOPE, PROVIDE FITTINGS AS REQ'D (TYP) (SEE ARCH PLANS FOR DRAIN ALONG BLDG)

PROP 4"Ø SCH-40 PVC DOWNSPOUT COLLECTION PIPE, 0.5% MIN SLOPE, PROVIDE FITTINGS AS REQ'D (TYP)

PROP BLDG ADDITION
FF=441.50

B-1
VDOT DI-2A
TOP=441.15
GRATE ELEV=440.65
INV OUT=436.40

PROP 27' - 12" STM
@ 0.55% SLOPE

B-1A
DOGHOUSE MH
TOP=441.30
SET TOP OUR OF FLOW LINE
PROP 12" INV IN=436.25±
EX 24" INV IN/OUT=436.00±

EX STM MH
TOP=441.01±
INV 24" OUT=436.54±

CONNECT TO PROP INTERNAL ROOF DRAIN, INV=438.5 (LOCATION PER PLUMBING PLANS)

EX STM MH
TOP=441.05±
INV 6" IN=438.38±
INV 24" IN=435.36±
INV 24" OUT=435.36±

PROP STM C.O.

PROP DOWNSPOUT CONNECTION (TYP) (SEE ARCH PLANS)

CORE DRILL & CONNECT TO EX ST MH INV=438.0±

ELEV MATCH EX

B-2
VDOT DI-1
TOP=441.20
INV OUT=439.45

PROP 60' - 12" HP
STM @ 1.25% SLOPE

B-3
VDOT DI-1
TOP=440.70
INV IN=438.70
INV OUT=438.60

PROP 78' - 12" HP
STM @ 4.80% SLOPE

B-4
VDOT DI-1
TOP=437.50
INV IN=434.85
INV OUT=434.60
H.P.=437.25

PROP 113' - 12" HP
STM @ 5.40% SLOPE

PROP 4"Ø SCH-40 PVC DOWNSPOUT COLLECTION PIPE, 0.5% MIN SLOPE, PROVIDE FITTINGS AS REQ'D (TYP)

PROP DOWNSPOUT CONNECTION (TYP) (SEE ARCH PLANS)

PROP BLDG ADDITION
FF=441.50

CONNECT TO PROP INTERNAL ROOF DRAIN, INV=439.0 (LOCATION PER PLUMBING PLANS)

PROP DOWNSPOUT CONNECTION (TYP) (SEE ARCH PLANS)

PROP STM C.O. W/ TRAFFIC RATED COVER LOCATED 5' FROM PROP BLDG

PROP 4"Ø SCH-40 PVC DOWNSPOUT COLLECTION PIPE, 0.5% MIN SLOPE, PROVIDE FITTINGS AS REQ'D

PROP 8"Ø SCH-40 PVC DOWNSPOUT COLLECTION PIPE, 0.5% MIN SLOPE, PROVIDE FITTINGS AS REQ'D

FORMGATE TROUGH AROUND GUTTER PAN TO ENSURE STORMWATER CONTINUES PAST

B-5
VDOT DI-1
TOP=434.50
INV IN (LAT)=430.50
INV IN=428.50
INV OUT=428.40

SEE BLOWUP DETAIL ON THIS SHEET FOR DETAIL

PROP 16' - 18" HP
STM @ 9.38% SLOPE

B-6
DOGHOUSE MH
TOP=433.20
SET TOP OUR OF FLOW LINE
PROP 12" INV IN=426.90±
EX 24" INV IN/OUT=426.65±

EX ELEC BOX T.B.R. & REPLACED AS REQ'D FOR INSTALLATION OF PROP STM

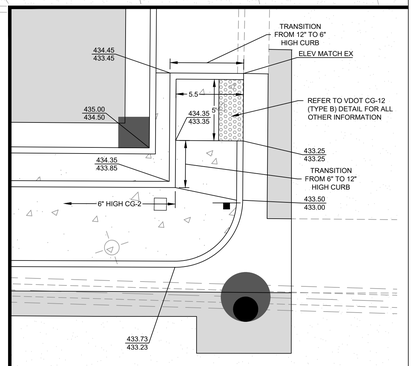
EX XFMR

EX 24" RCP

12:1 MAX

NORTH

0 5' 10' 20' 30'
SCALE: 1" = 10'



PROP HANDICAP RAMP BLOWUP DETAIL
SCALE: 1" = 5'

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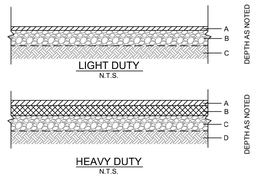
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GRADING & DRAINAGE PLAN

C-1.4

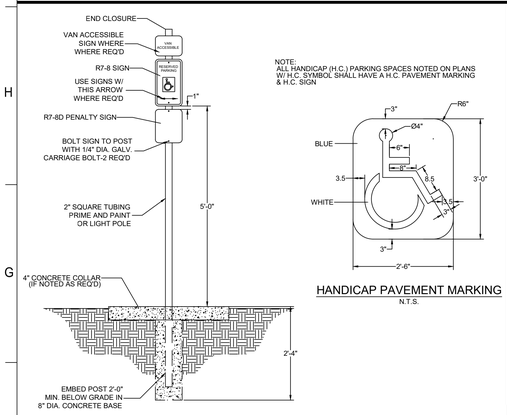


ASPHALTIC PAVEMENT NOTES:

1. PLACE TACK COAT BETWEEN ASPHALT LIFTS.
2. PLACE AGGREGATE BASE COURSE IN TWO SEPARATE, EQUAL LIFTS

ASPHALT PAVEMENT DETAILS

N.T.S.



HANDICAP SIGN DETAIL

N.T.S.

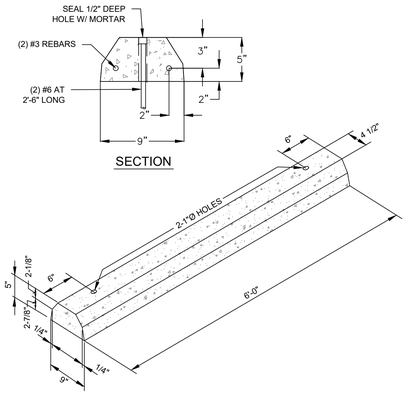
NOTE:
ALL HANDICAP (H.C.) PARKING SPACES NOTED ON PLANS W/ H.C. SYMBOL SHALL HAVE A H.C. PAVEMENT MARKING & H.C. SIGN

HANDICAP PAVEMENT MARKING

N.T.S.

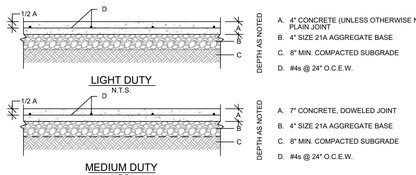
HANDICAP PARKING SPACE MARKER & SIGN DETAIL

N.T.S.



PRECAST CONCRETE WHEEL STOP DETAIL

N.T.S

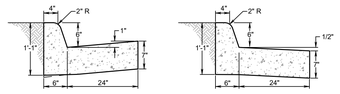


CONCRETE PAVEMENT NOTES:

1. PROVIDE CONTRACTION & EXPANSION JOINTS AS PER PLANS
2. SEE PAVEMENT PLAN FOR CONCRETE FINISHES

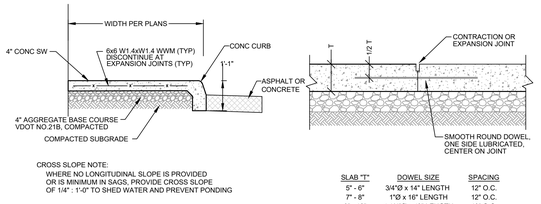
CONCRETE PAVEMENT DETAILS

N.T.S.



NOTES:
1. ALL CONCRETE TO BE VDOT CLASS A3, AIR ENTRAINED (3,000psi)
2. ALL CURB & GUTTER TO HAVE A 4" MINIMUM VDOT 21-B STONE SUB-BASE.
3. PROVIDE TOOLED CONTROL JOINTS AT 10 FOOT SPACING
4. FINISH TO BE LIGHT BROOM

SITE CONCRETE CURB & GUTTER DETAILS



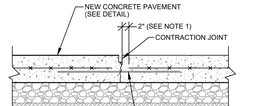
TURNED DOWN CONCRETE SIDEWALK DETAIL

N.T.S

SLAB "T"	DOWEL SIZE	SPACING
5" - 6"	3/4"Ø x 14" LENGTH	12" O.C.
7" - 8"	1"Ø x 16" LENGTH	12" O.C.
9" - 12"	1 1/4"Ø x 18" LENGTH	12" O.C.

CONCRETE DOWEL JOINT DETAIL

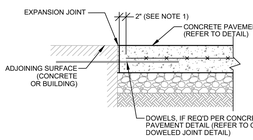
N.T.S



CONTRACTION JOINT NOTES:
1. STOP SLAB REINFORCEMENT AT JOINTS
2. JOINT TO BE 1/4" WIDE SAWN JOINT, DEPTH EQUAL TO 1/4 OF THE SLAB DEPTH OR 1" MINIMUM FOLLOWING CURING OF CONCRETE
3. JOINT TO BE FILLED TO SURFACE WITH POLYURETHANE JOINT SEALER.
4. CONTRACTION JOINTS SHALL BE SPACED NOT TO EXCEED 1/24 THE THICKNESS OF THE SLAB IN ANY DIRECTION.

CONCRETE PAVEMENT CONTRACTION JOINT DETAIL

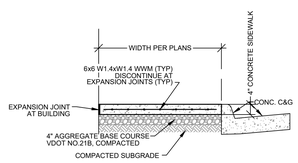
N.T.S



EXPANSION JOINT NOTES:
1. STOP SLAB REINFORCEMENT AT JOINTS
2. JOINT TO BE 1/2" WIDE, FULL DEPTH.
3. FILL JOINT TO WITHIN 1/4" OF PAVEMENT SURFACE WITH AN ASPHALT IMPREGNATED PREMOLD FILLER AND TO SURFACE WITH POLYURETHANE JOINT SEALER.
4. EXPANSION JOINTS SHALL BE SPACED NOT TO EXCEED 60' IN EITHER DIRECTION FOR CONTINOUS SLABS AND ALONG ALL BUILDING STRUCTURES.

CONCRETE PAVEMENT EXPANSION JOINT DETAIL

N.T.S



CROSS SLOPE NOTE:
WHERE NO LONGITUDINAL SLOPE IS PROVIDED OR IS MINIMUM IN SAGS, PROVIDE CROSS SLOPE OF 1/4" : 1'-0" TO SHED WATER AND PREVENT PONDING

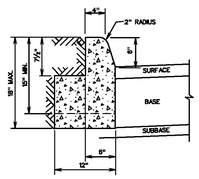
CONCRETE SIDEWALK DETAIL

N.T.S

CG-2

NOTES:

1. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
2. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.
3. CURB HAVING A RADIUS OF 300 FEET OR LESS (ALONG FACE OF CURB) WILL BE PAID FOR AS RADIAL CURB.
4. THE DEPTH OF CURB MAY BE REDUCED AS MUCH AS 1" FOR SHORT SECTIONS (LENGTH AS MUCH AS 3') IN ORDER THAT THE BOTTOM OF CURB WILL COINCIDE WITH THE TOP OF A COURSE OF THE PAVEMENT SUBSTRUCTURE. OTHERWISE, THE DEPTH IS TO BE 10" AS SHOWN. NO ADJUSTMENT IN THE PRICE BID IS TO BE MADE FOR A DECREASE OR AN INCREASE IN DEPTH.
5. CG-2 IS TO BE USED ON ROADWAYS MEETING THE REQUIREMENTS FOR CG-6 AS SHOWN IN APPENDIX A OF THE VDOT ROAD DESIGN MANUAL, IN THE SECTION ON GS URBAN STANDARDS.



ACCEPTABLE ALTERNATIVE IF CURB IS EXTRUDED

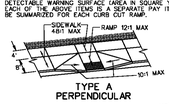
SPECIFICATION REFERENCE	STANDARD 6" CURB	VDOT ROAD AND BRIDGE STANDARDS	
105, 502	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE	SHEET 1 OF 1
			201.01

CG-12

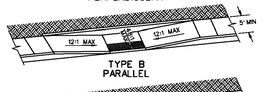
GENERAL NOTES:

1. THE DETECTABLE WARNING SHALL BE PROVIDED BY TRUNCATED DOMES.
2. ALL DETECTABLE WARNING SURFACE PRODUCTS SHALL MEET THE REQUIREMENTS OF SECTION 504 OF THE SPECIFICATIONS FOR CG-12 DETECTABLE WARNING SURFACE. DETECTABLE WARNING SUFACE PRODUCTS USED SHALL BE FROM THE MATERIALS APPROVED PRODUCT LIST NUMBER 72.
3. SLOPING SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
4. REQUIRED BARS ARE TO BE NO.5 X 8'-0" PLACED 1' CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR, MINIMUM CONCRETE COVER 1½".
5. ROADWAY CURB / CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB / CURB AND GUTTER.
6. CURB RAMPS ARE REQUIRED FOR SIDEWALKS AND SHARED USE PATHS. THE WIDTH OF THE CURB RAMP SHALL MATCH SIDEWALK WIDTH WHEN CURB RAMPS ARE USED IN CONJUNCTION WITH A SHARED USE PATH, THE MINIMUM WIDTH SHALL BE THE WIDTH OF THE SHARED USE PATH.
7. DETECTABLE WARNINGS SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP/ LANDING FLOOR.
8. CURB RAMPS WILL BE INSTALLED AND LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER. CURB RAMPS SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES, LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC.
9. RAMPS MAY BE PLACED ON RADIAL OR TANGENTIAL SECTIONS PROVIDED THAT THE CURB OPENING IS PLACED WITHIN THE LIMITS OF THE CROSSWALK AND THAT THE SLOPE AT THE CONNECTION OF THE CURB OPENING IS PERPENDICULAR TO THE CURB.
10. DETECTABLE WARNING SURFACE PANELS SHALL BE INSTALLED FLUSH WITH THE BACK OF CURB.
11. WHERE CURB RAMPS INTERSECT A RADIAL SECTION OF CURB AT ENTRANCES OR STREET CONNECTIONS THE DETECTABLE WARNING SURFACE SHALL HAVE A FACTORY RADIUS OR BE FIELD-MODIFIED AS RECOMMENDED BY THE MANUFACTURER TO MATCH THE RADIUS OF CURB. SEE CG-12-INS PAGES 204.06 AND 204.07 FOR METHODS OF INSTALLING DETECTABLE WARNINGS ON A RADIUS.

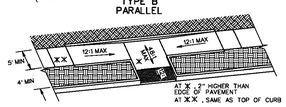
NOTE: COMPONENTS OF CURB RAMPS CONSIST OF THE FOLLOWING: HYDRAULIC CEMENT SIDEWALK (DEPTH IN INCHES, AREA IN SQUARE YARDS) CURB WHEN REQUIRED (CG-2 OR CG-3 IN LINEAR FEET) DETECTABLE WARNING SURFACE (AREA IN SQUARE YARDS) EACH OF THE ABOVE ITEMS IS A SEPARATE PAY ITEM AND SHOULD BE SUMMARIZED FOR EACH CURB CUT RAMP.



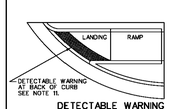
TYPE A PERPENDICULAR



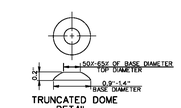
TYPE B PARALLEL



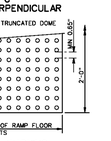
TYPE C PARALLEL & PERPENDICULAR



DETECTABLE WARNING INSTALLED ON A RADIUS



TRUNCATED DOME DETAIL



DETECTABLE WARNING DETAIL

SPECIFICATION REFERENCE	ROAD AND BRIDGE STANDARDS	
105, 502, 504	SHEET 1 OF 5	REVISION DATE 04/19
	204.01	

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

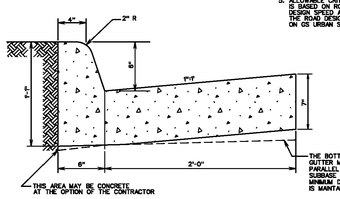
CG-12 DETECTABLE WARNING SURFACE (GENERAL NOTES)

VIRGINIA DEPARTMENT OF TRANSPORTATION

CG-6

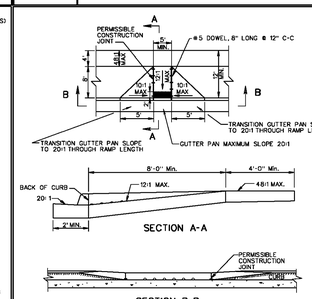
NOTES:

1. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
2. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.
3. COMBINATION CURB & GUTTER HAVING A RADIUS OF 300 FEET OR LESS (ALONG FACE OF CURB) SHALL BE PAID FOR AS RADIAL COMBINATION CURB & GUTTER.
4. FOR USE WITH STABILIZED OPEN-GRADED DRAINAGE LAYER. THE BOTTOM OF THE CURB & GUTTER SHALL BE CONSTRUCTED PARALLEL TO THE SLOPE OF SUBBASE COURSES AND TO THE DEPTH OF THE PAVEMENT.
5. ALLOWABLE CRITERIA FOR THE USE OF CG-6 IS BASED ON ROADWAY CLASSIFICATION AND DESIGN SPEED AS SHOWN IN APPENDIX A OF THE ROAD DESIGN MANUAL IN THE SECTION ON GS URBAN STANDARDS.

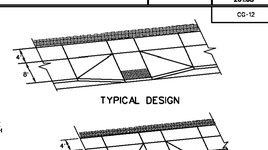


SPECIFICATION REFERENCE	COMBINATION 6" CURB AND GUTTER	VDOT ROAD AND BRIDGE STANDARDS	
105, 502	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE	SHEET 1 OF 1
			201.03

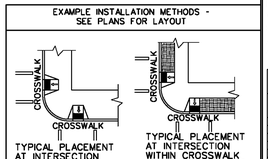
CG-12



NOTES:
1. FOR GENERAL NOTES ON THE DETECTABLE WARNING SURFACE, SEE SHEET 1 OF 5.
2. THIS DESIGN TO BE USED FOR CONSTRUCTION THAT INCORPORATES WIDER SIDEWALK, LANDING (4' WIDE) REQUIRED AT TOP OF CURB RAMP. MINIMUM CURB RAMP LENGTH 8 FEET FOR NEW CONSTRUCTION.
3. GUTTER PAN SHALL BE A MAXIMUM SLOPE OF 20:1 AT THE RAMP OPENING.
4. DIAGONAL PLACEMENT IS NOT PERMITTED.



EXAMPLE INSTALLATION METHODS - SEE PLANS FOR LAYOUT



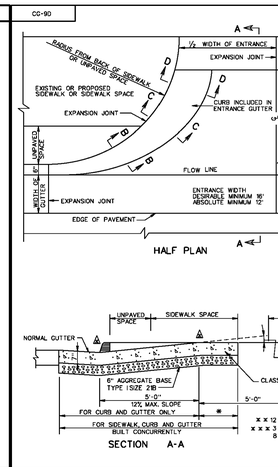
SPECIFICATION REFERENCE	ROAD AND BRIDGE STANDARDS	
105, 502, 504	REVISION DATE 04/19	SHEET 2 OF 5
		204.02

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

CG-12 DETECTABLE WARNING SURFACE TYPE A (PERPENDICULAR) APPLICATION

VIRGINIA DEPARTMENT OF TRANSPORTATION

CC-90



ADDITIONAL RIGHT-OF-WAY IS REQUIRED IF THE LIMITS OF PEDESTRIAN ACCESS ROUTE (■) EXTEND BEYOND EXISTING OR PROPOSED VDOT RIGHT-OF WAY.

■ PEDESTRIAN ACCESS ROUTES PROVIDE A CONTINUOUS UNOBSTRUCTED PUBLIC PATH THAT MAY INCORPORATE ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PEDESTRIANS.

* IF PEDESTRIAN ACCESS ROUTES (■) ARE BEING PROVIDED, A MINIMUM 4' TRAVERSABLE WIDTH IS REQUIRED WITH A MAX. 2% CROSS SLOPE.

WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB CONFIGURATION.

XX% MAXIMUM INCREASE IN SLOPE AT MINIMUM 10' INTERVALS
XX% MAXIMUM DECREASE IN SLOPE FOR FIRST 10' INTERVAL AND 8% MAXIMUM DECREASE FOR SUCCEEDING MINIMUM 10' INTERVALS

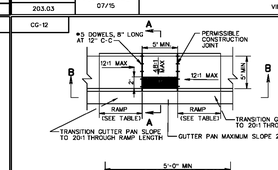
ROAD AND BRIDGE STANDARDS	
SHEET 1 OF 1	REVISION DATE 07/15
203.03	

CC-12

STANDARD ENTRANCE GUTTER

VIRGINIA DEPARTMENT OF TRANSPORTATION

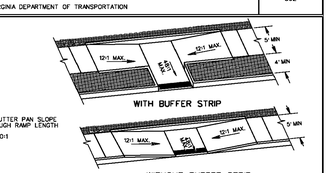
SPECIFICATION REFERENCE: 502



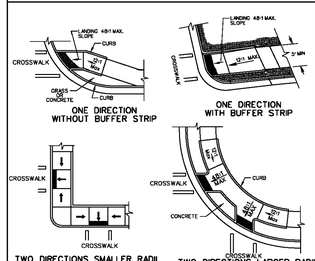
NOTES:
1. FOR GENERAL NOTES ON THE DETECTABLE WARNING SURFACE, SEE SHEET 1 OF 5.
2. THE REQUIRED LENGTH OF A PARALLEL RAMP IS LIMITED TO 15 FEET, REGARDLESS OF THE SLOPE.
3. GUTTER PAN SHALL BE A MAXIMUM SLOPE OF 20:1 AT THE RAMP OPENING.
4. DIAGONAL PLACEMENT IS NOT PERMITTED.

TYPE B PARALLEL APPLICATION

ROADWAY GRADE IN PERCENT	MINIMUM RAMP LENGTH IN FEET	
	4" CURB	6" CURB
0	4	6
1	5	7
2	5	8
3	6	9
4	8	12
5	10	15
6	14	15



EXAMPLE INSTALLATION METHODS - SEE PLANS FOR LAYOUT



SPECIFICATION REFERENCE	ROAD AND BRIDGE STANDARDS	
105, 502, 504	SHEET 3 OF 5	REVISION DATE 04/19
	204.03	

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

CG-12 DETECTABLE WARNING SURFACE TYPE B (PARALLEL) APPLICATION

VIRGINIA DEPARTMENT OF TRANSPORTATION

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM
B&B Consultants, Inc.
Engineers-Planners
Surveyors-Lab Analysts

COMMONWEALTH OF VIRGINIA
SAMUEL PATRICK CARROLL
Lic. No. 046622
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

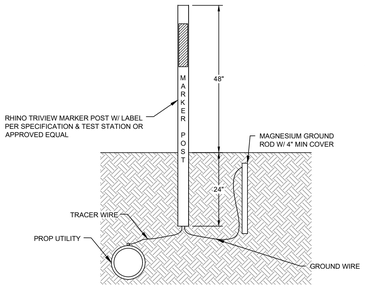
TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

CONSTRUCTION DETAILS

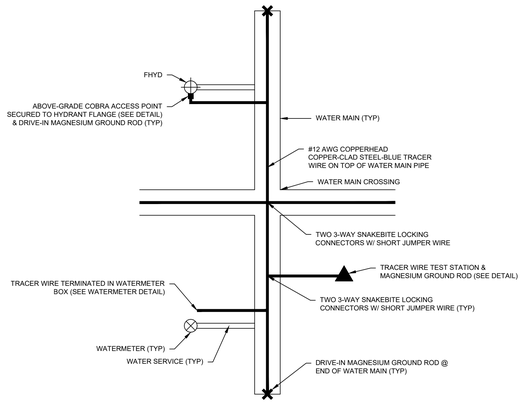
C-2.1



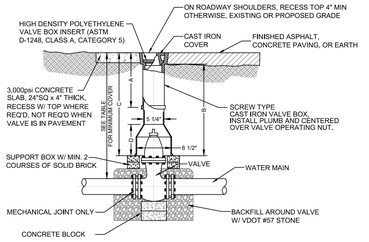
TRACING WIRE NOTES:

1. TRACER WIRE STATIONS SHALL BE LOCATED DIRECTLY OVER TOP OF TOP OF UTILITIES OR IMMEDIATELY ADJACENT TO VAULTS OR BOXES, UNLESS LOCATED BETWEEN DITCH LINE AND ROADWAY OR IN PAVEMENT. MARKER TO THEN BE OFFSET AS REQUIRED.
2. TRACER WIRE STATIONS SHALL BE LABELED "TRACER STATION", AND IF APPLICABLE "VALVE".
3. TRACER WIRE SHALL BE SPLICED AS PER SPECIFICATIONS.
4. TRACER WIRE TO BE CONNECTED TO STATION AS PER MANUFACTURER'S RECOMMENDATIONS
5. TRACER WIRE STATIONS SHALL BE PLACED AT THE FOLLOWING LOCATIONS:
   a. AT EVERY MAINLINE SHUT-OFF VALVE (EXCLUDING VALVES TO FIRE HYDRANTS). IF MULTIPLE VALVES ARE LOCATED WITHIN APPROXIMATELY FIVE FEET OF EACHOTHER, ONLY ONE STATION SHALL BE REQUIRED.
   b. AT ANY LOCATION SPECIFICALLY NOTED ON PLANS
   c. A MINIMUM OF EVERY 2,000FT ALONG THE UTILITY
6. CONTRACTOR TO ENSURE THAT TEST STATION IS INSTALLED PER MANUF. INSTRUCTIONS & THAT TRACER WIRE & GROUND WIRE ARE CONNECTED TO APPROPRIATE TERMINALS.
7. CONTRACTOR TO ENSURE APPROPRIATE COVER TO PREVENT DAMAGE TO TRACER WIRE/GROUND WIRE.

TRACER WIRE TEST STATION DETAILS
N.T.S.

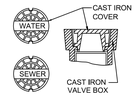


TRACER WIRE SCHEMATIC - PRESSURE PIPE
N.T.S.



EXTENSION RANGE - C	DIM. A	DIM. B	DIM. D
18"-24"	10.5"	14.5"	6.5"
24"-29"	15"	24"	6.5"
36"-48"	15"	36"	8.5"
36"-60"	26"	36"	8.5"

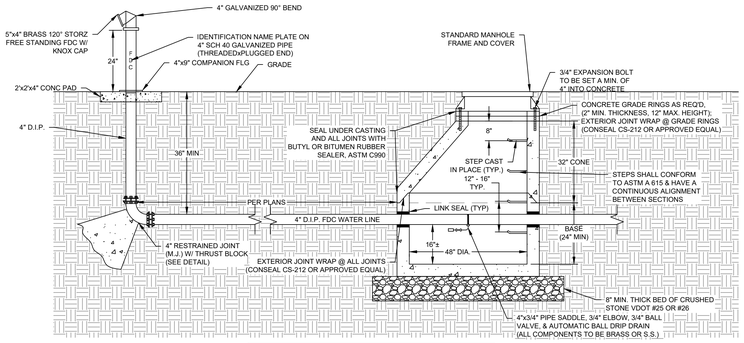
LONGER BOXES ARE MADE BY ADDING EXTENSIONS.



MINIMUM COVER FOR GATE VALVE	
SIZE OF VALVE	MINIMUM COVER
6" OR LESS	36"
8"	38"
10"	43"
12"	46"
14"	50"
16"	52"
18"	55"
20"	60"

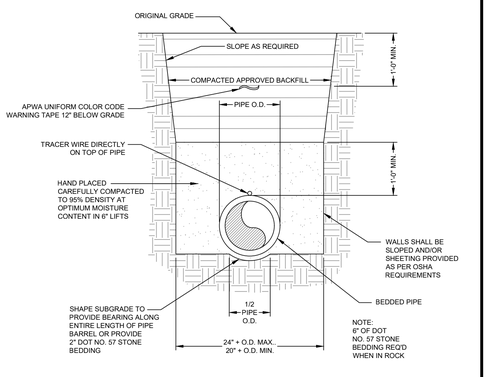
NOTES:
1. VALVE SHALL NOT BE LOCATED IN DITCHES UNLESS UNAVOIDABLE. 2. CONTRACTOR SHALL FURNISH VALVE WRENCHES SUITABLE FOR OPENING AND CLOSING VALVES WITH A 2" OPERATING NUT. VALVE WRENCHES SHALL BE OF SUFFICIENT LENGTH TO ALLOW THE HANDLE OF THE WRENCH TO BE A MIN. OF 36" ABOVE GRADE WHEN THE WRENCH IS ON THE VALVE. THE CONTRACTOR SHALL PROVIDE THE REQUIRED NUMBER OF WRENCHES TO MEET THE ABOVE REQUIREMENTS
2. CAST IRON SHALL CONFORM TO ASTM A-48M CLASS 30S.
3. TOP SHALL BE SET FLUSH WITH FINISH GRADE, UNLESS LOCATED IN SHOULDER OF ROADWAY

VALVE AND SCREW TYPE BOX DETAIL
N.T.S.



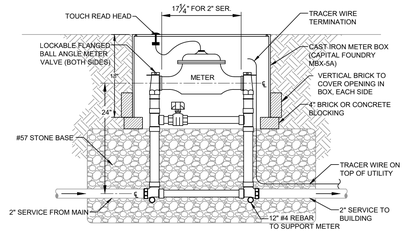
NOTE: MATERIALS AND FABRICATION IN ACCORDANCE WITH ASTM C478. CONE SHALL BE OF THE ECCENTRIC TYPE. CONNECT PIPE TO SECTION WITH APPROVED FLEXIBLE WATER-TIGHT SLEEVE OR GASKET (INTERPACE OR EQUAL). THE FLEXIBLE WATER-TIGHT SLEEVE OR GASKET SHALL BE INSTALLED PER THE MANUFACTURER'S RECOMMENDATIONS.

FDC RISER & MANHOLE DETAIL
N.T.S



PIPE LAYING CONDITION - PRESSURE PIPE
N.T.S.

NOTES:
1. METER TO BE AS MANUFACTURED BY SENSUS
2. ALL FITTINGS SHALL BE FLARED, MALLEABLE BRASS
3. BACKFILL TAMPED IN 6" LIFTS
4. 4" MINIMUM AND 12" MAXIMUM VERTICAL CLEARANCE FROM TOP OF METER TO BOTTOM OF METER BOX COVER
5. METER SETTER SHALL BE MCDONALD SERIES 720R7 OR APPROVED EQUAL
6. ASSE COMPLIANT DOUBLE CHECK BACK FLOW PREVENTOR SHALL BE INSTALLED IN BUILDING.



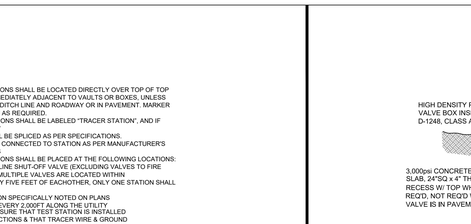
2" WATER SERVICE METER
N.T.S.

WATER SERVICE TUBING, SANITARY SEWER LATERAL PIPING, & DOWNSPOUT COLLECTION/INTERNAL ROOF DRAIN COLLECTION PIPING BEDDING DETAIL
N.T.S

WATER SERVICE CONNNECTION DETAIL
N.T.S.

NOTES:

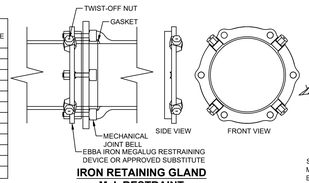
1. THRUST RESTRAINT SHALL BE INSTALLED ON DUCTILE IRON "DIP" AND PVC FORCEMAINS AND WATERLINES IN THE MANNER SHOWN PER THIS DETAIL. SEE STANDARD THRUST BLOCK DETAIL FOR ADDITIONAL RESTRAINT CRITERIA.
2. RESTRAINING DEVICES SHALL CONFORM TO ANSI/AWWA C111/A21.11 AND ANSI/AWWA C153/A21.53 OF LATEST REVISION.
3. COMPACT FITTINGS ARE ACCEPTABLE FOR USE WITH IRON RETAINING GLAND M.J. RESTRAINT.
4. THE MINIMUM LENGTH OF RESTRAINT INDICATED SHALL REQUIRE ALL JOINTS WITHIN THAT DISTANCE BE RESTRAINED.
5. RESTRAINT SYSTEMS SHALL BE INSPECTED AND APPROVED PRIOR TO BACKFILLING.
6. RESTRAINT SYSTEMS MAY VARY BASED UPON THE ENGINEERS DESIGN AS SHOWN ON THE PLAN AND PROFILE SHEETS.
7. MAKE ANY JOINT DEFLECTION NECESSARY BEFORE TORQUING THE T-HEADS BOLTS.
8. TIGHTEN T-HEAD BOLTS, BOTTOM FIRST, THEN TOP, SIDES AND REMAINDER.
9. REPEAT NOTE 1. UNTIL ALL T-BOLTS ARE PROPERLY TORQUED.
10. TIGHTEN TWIST - OFF NUTS SO THAT ALL WEDGES FIRMLY CONTACT PIPE.
11. TIGHTEN TWIST - OFF NUTS IN ALTERNATING MANNER, SHEARING OFF NUTS.
12. MEGALUG, STARGRIP, (OR APPROVED EQUAL) MAY BE RESET OR REUSED BY ASSEMBLY AS DESCRIBED ABOVE AND TORQUE WEDGE BOLTS TO 90 FT. LBS
13. ANY PLACE A RESTRAINED FITTING IS CALLED OUT ON THE DRAWINGS, THE ADJOINING PIPE JOINTS SHALL ALSO BE RESTRAINED TO A DISTANCE IN BOTH DIRECTIONS FROM THE DESIGNATED FITTING AS INDICATED IN THIS TABLE.
14. TOTAL LENGTH BETWEEN FIRST JOINT OR RESTRAINED LENGTH ON EITHER SIDE OF TEE (RUN) SHALL BE A TOTAL DISTANCE OF 30 FEET (MIN.). SEE SCHEDULE BELOW FOR RESTRAINT LENGTH ON TEE "BRANCH" LINE.



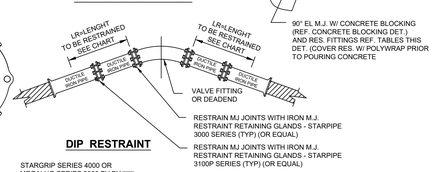
VERTICAL RESTRAINT

90° EL M.J. W/ CONCRETE BLOCKING (REF. CONCRETE BLOCKING DET.) AND RES. FITTINGS REF. TABLES THIS DET. (COVER RES. W/ POLYWRAP PRIOR TO POURING CONCRETE

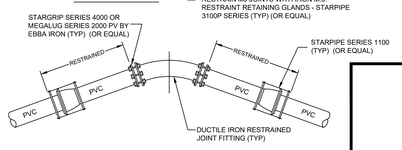
NOMINAL PIPE SIZE (INCHES)	NUMBER OF TWIST-OFF NUTS	NUMBER OF BOLTS	RATED PRESSURE
3	2	4	350 PSI
4	2	4	350 PSI
6	3	6	350 PSI
8	4	6	350 PSI
10	6	8	350 PSI
12	8	8	350 PSI
16	12	12	350 PSI
18	12	12	250 PSI
24	16	16	250 PSI
30	20	20	250 PSI
36	24	24	250 PSI
42	28	28	250 PSI

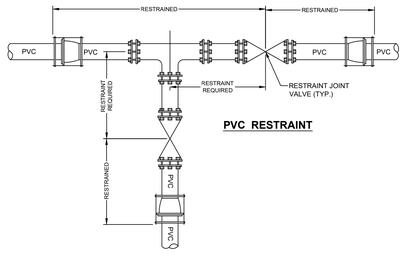


IRON RETAINING GLAND M.J. RESTRAINT



DIP RESTRAINT





PVC RESTRAINT

JOINT RESTRAINT TABLE - PVC								
RESTRAIN ALL JOINTS WITHIN THESE LENGTHS. (LF EA. SIDE OF FITTING)								
PIPE SIZE (INCHES)	11 1/4° BEND	22 1/2° BEND	45° BEND	90° BEND	DEAD END/ VALVE	REDUCER	VERT 45° BEND
6"	4	8	17	41	99	6"X8" 54'	41'/17'
8"	6	11	22	53	129	8"X12" 97'	54'/42'
12"	8	15	31	73	182	12"X16" 99'	76'/31'
16"	10	19	39	93	233	16"X20" 99'	97'/39'
20"	11	22	46	111	282	20"X24" 99'	117'/46'
24"	13	26	53	127	328		136'/53'

JOINT RESTRAINT TABLE- PVC		
TEE		
RESTRAIN ALL JOINTS WITHIN THESE LENGTHS. (LF FROM BRANCH)		
RUN SIZE (INCHES)	BRANCH SIZE (INCHES)	LENGTH (LF)
6"	4"	70
6"	6"	99
8"	<8"	99
8"	8"	127
10"	<10"	129
10"	10"	154
12"	<12"	154
12"	12"	154
14"	<14"	182
14"	14"	211
16"	<16"	211
16"	16"	233
20"	<20"	257
20"	20"	282
24"	<24"	282
24"	24"	328

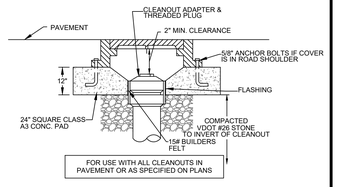
JOINT RESTRAINT TABLE - DIP		
TEE		
RESTRAIN ALL JOINTS WITHIN THESE LENGTHS. (LF FROM BRANCH)		
RUN SIZE (INCHES)	BRANCH SIZE (INCHES)	LENGTH (LF)
6"	4"	38
6"	6"	54
8"	<8"	54
8"	8"	70
10"	<10"	70
10"	10"	84
12"	<12"	84
12"	12"	98
14"	<14"	98
14"	14"	112
16"	<16"	112
16"	16"	126
20"	<20"	139
20"	20"	152
24"	<24"	152
24"	24"	177

JOINT RESTRAINT TABLE - DIP							
RESTRAIN ALL JOINTS WITHIN THESE LENGTHS. (LF EA. SIDE OF FITTING)							
PIPE SIZE (INCHES)	11 1/4° BEND	22 1/2° BEND	45° BEND	90° BEND	DEAD END/ VALVE	REDUCER	VERT 45° BEND
6"	3	6	13	30	54	6"X8" 54'	23'/13'
8"	4	8	17	39	70	8"X12" 97'	29'/17'
12"	6	11	23	55	98	12"X16" 99'	41'/23'
16"	7	14	29	69	126	16"X20" 99'	52'/29'
20"	9	17	35	83	152	20"X24" 99'	63'/35'
24"	10	19	40	96	177		73'/40'

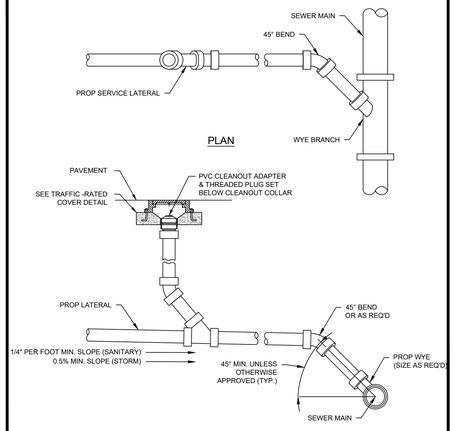
RESTRAINED PIPE DETAIL
N.T.S

CALCULATION CONDITIONS:
TRENCH = TYPE 3
SOIL TYPE = ML
DEPTH = 3 FEET
TEST PRESSURE = 150 PSI
SAFETY FACTOR = 2.0

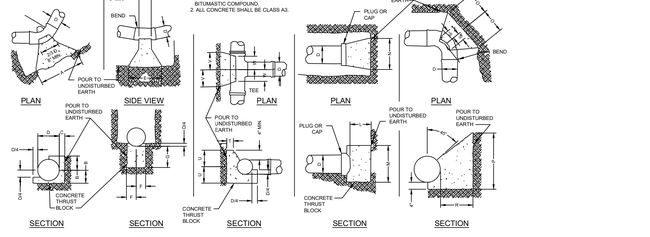
NOTE:
SEE REGIONAL CONSTRUCTION STANDARDS SANITARY SERVICE LATERAL CLEAN OUT FRAME AND COVER DETAIL FOR MANUFACTURER.



SEWER CLEANOUT COVER - TRAFFIC BEARING
N.T.S.



SEWER LATERAL & CLEANOUT
N.T.S



HORIZONTAL BENDS (11 1/4° - 45°) | UPPER VERTICAL BENDS | TEES | PLUGS | HORIZONTAL BENDS (90°)

REACTION BLOCKING																																	
DIA	HORIZONTAL BENDS									UPPER VERTICAL BENDS										PLUGS			HORIZONTAL BENDS				TEE						
	11 1/4°			22 1/2°			45°			11 1/4°			22 1/2°			45°						90°				BRANCH						
	A	B	C	A	B	C	A	B	C	E	F	G	E	F	G	E	F	G	L	M	N	O	P	R	S	T	U	V	W				
4"	.50	.58	.75	.75	.58	.75	1.25	.58	.75	.50	.58	.58	.75	.58	.58	1.25	.58	.58	.50	1.17	1.50	1.17	1.17	1.67	.42	.75	.67	.75	.50				
6"	.50	.58	.75	.75	.58	.75	1.25	.58	.75	.50	.58	.58	.75	.58	.58	1.25	.58	.58	.50	1.17	1.50	1.17	1.17	1.67	.42	.75	.67	.75	.50				
8"	.67	.67	.75	1.00	.67	.75	2.00	.67	.75	.67	.67	.58	1.00	.67	.67	2.08	.75	.83	.67	1.50	2.25	1.58	1.50	1.75	.50	.75	.83	1.00	.67				
10"	.83	.75	.75	1.50	.75	.83	2.50	.75	.92	.83	.75	.67	1.50	.83	.67	2.08	.75	.83	.67	2.00	2.50	1.67	2.08	1.75	.50	.83	1.00	1.25	.67				
12"	1.00	.83	.75	1.75	.92	.92	2.92	.92	1.17	1.00	.83	.67	1.75	.83	.67	2.50	.92	.92	.83	2.33	3.25	2.00	2.50	1.92	.58	1.00	1.25	1.42	.67				
16"	1.33	1.00	.75	2.33	1.00	1.17	3.67	1.25	1.42	1.33	1.00	.75	2.25	.83	.75	3.33	1.25	1.25	1.00	2.92	4.17	2.08	3.00	2.17	.83	1.17	1.67	1.83	.83				
20"	1.67	1.17	1.00	3.17	1.17	1.33	4.75	1.50	1.83	1.67	1.17	.83	3.00	1.17	1.00	4.17	1.50	1.50	1.33	3.75	5.17	3.50	3.83	2.83	1.00	1.33	2.08	2.25	1.17				
24"	2.00	1.33	1.00	4.00	1.33	1.50	6.08	1.67	1.92	2.00	1.33	1.00	3.50	1.33	1.00	5.00	1.75	1.75	1.67	4.33	6.25	4.67	4.00	3.00	1.00	1.50	2.50	2.67	1.33				
30"	2.50	1.50	1.08	5.00	1.58	1.75	7.95	2.00	3.08	2.50	1.58	1.08	4.17	1.58	1.08	6.25	2.25	2.25	2.00	5.42	7.42	5.75	5.00	3.83	1.17	1.75	3.08	3.92	1.83				
36"	3.00	1.92	1.17	5.75	2.00	2.00	8.92	2.50	3.33	3.00	1.58	1.17	5.33	2.00	1.17	7.50	2.50	2.67	2.00	6.50	9.00	6.83	6.00	4.83	1.17	2.00	3.75	3.92	1.83				

Moseley
B&B Consultants, Inc.
Engineers-Planners
Surveyors-Lab Analysts
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
SAMUEL PATRICK CARROLL
Lic. No. 046622
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

UTILITY DETAILS

C-2.2

EROSION & SEDIMENT CONTROL NARRATIVE

PROJECT DESCRIPTION

The purpose of this project is to renovate and construct building expansions to the existing Lake Country Advanced Knowledge Center, which is being repurposed to be the new Town of South Hill Police Station. This project will include regrading the existing parking lots, installing 300 LF of storm sewer to convey storm water, connecting internal downspouts to the drainage system, installing vehicle entrances & redoing sidewalk along East Danville Street, connecting any utilities as shown on plan for the new expansions, and repaving the entirety of East Pine Lane. The area to be disturbed is 0.80± acres. Since the area to be disturbed is not greater than one acre, a Virginia Stormwater Management Program (VSMP) permit will not be required.

EXISTING SITE CONDITIONS

The existing site is the existing Lake Country Advance Knowledge Center and its parking lot on either side, and the limits of the proposed project extend north into East Pine Lane. The site is almost entirely developed impervious area.

ADJACENT PROPERTY

The site is bordered by East Danville Street & RT Arnold Public Library to the south, Brook Avenue & Colonial Farm Credit to the east, East Pine Lane & municipal buildings to the North, & South Mecklenburg Avenue & the Colonial Center for Performing Arts to the West.

OFF-SITE AREAS

There are no off-site areas included with this project.

SOIL

Soils within the project site are primarily Appling Fine Sandy Loams (Soils Group B). Soil types and locations are taken from the Web Soil Survey produced by the United States Department of Agriculture at <http://websoilsurvey.nrcs.usda.gov/app/>.

CRITICAL AREA

There are no critical areas in this project.

EROSION AND SEDIMENT CONTROL MEASURES

The following practices must be met by the contractor per the **Virginia Erosion and Stormwater Management Regulations, Erosion & Sediment Control Criteria, Techiques, and Methods**: Minimum Standards, Section 9VAC 25-875-560:

1. Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site. Temporary soil stabilization shall be applied within seven days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days. Permanent stabilization shall be applied to areas that are to be left dormant for more than one year.
2. During construction of the project, soil stock piles and borrow areas shall be stabilized or protected with sediment trapping measures. The applicant is responsible for the temporary protection and permanent stabilization of all soil stockpiles on site as well as borrow areas and soil intentionally transported from the project site.
3. A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.
4. Sediment basins and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place.
7. Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Slopes that are found to be eroding excessively within one year of permanent stabilization shall be provided with additional slope stabilizing measures until the problem is corrected.
8. Concentrated runoff shall not flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume or slope drain structure.
9. Whenever water seeps from a slope face, adequate drainage or other protection shall be provided.
10. All storm sewer inlets that are made operable during construction shall be protected so that sediment-laden water cannot enter the conveyance system without first being filtered or otherwise treated to remove sediment.
11. Before newly constructed stormwater conveyance channels or pipes are made operational, adequate outlet protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel and receiving channel.
16. Underground utility lines shall be installed in accordance with the following standards in addition to other applicable criteria:
    a. No more than 500 linear feet of trench may be opened at one time.
    b. Excavated material shall be placed on the uphill side of trenches.
    c. Effluent from dewatering operations shall be filtered or passed through an approved sediment trapping device, or both, and discharged in a manner that does not adversely affect flowing streams or off-site property.
    d. Material used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization.
    e. Restabilization shall be accomplished in accordance with this chapter.
    f. Applicable safety requirements shall be complied with.
17. Where construction vehicle access routes intersect paved or public roads, provisions shall be made to minimize the transport of sediment by vehicular tracking onto the paved surface. Where sediment is transported onto a paved or public road surface, the road surface shall be cleaned thoroughly at the end of each day. Sediment shall be removed from the roads by shoveling or sweeping and transported to a sediment control disposal area. Street washing shall be allowed only after sediment is removed in this manner. This provision shall apply to individual development lots as well as to larger land-disturbing activities.
18. All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed, unless otherwise authorized by the VESCP authority. Trapped sediment and the disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

EROSION AND SEDIMENT CONTROL NOTES

1. Unless otherwise indicated, all vegetative and structural erosion and sediment control practices will be constructed and maintained according to minimum technical requirements as outlined within **Chapter 5 - Erosion and Sediment Control and Stormwater Management Requirements**, **5.3 Technical Criteria**, of the Virginia Stormwater Management Handbook.
2. The plan approving authority must be notified one (1) week prior to the pre-construction conference, a week prior to the commencement of land disturbing activity, and one (1) week prior to the final inspection.
3. All erosion and sediment control measures are to be placed prior to or as the first step in clearing.
4. A copy of the approved erosion and sediment control plan shall be maintained on the site at all times.
5. Prior to commencing land disturbing activities in areas other than indicated on these plans (including, but not limited to, off-site borrow or waste areas), the contractor shall submit a supplementary erosion control plan to the owner for review and approval by the plan approving authority.
6. The contractor is responsible for installation of any additional erosion control measures necessary to prevent erosion and sedimentation as determined by the plan approving authority.
7. All disturbed areas are to drain to approved sediment control measures at all times during land disturbing activities and during site development until final stabilization.
8. During dewatering operations, water will be pumped into an approved filtering bag / device.
9. The contractor shall inspect all erosion control measures periodically and after each runoff-producing rainfall event. Any necessary repairs or cleanup to maintain the effectiveness of the erosion control devices shall be made immediately.
10. The contractor is responsible for the daily removal of sediment that has been transported on to a paved or public road surface.
11. Seeding operations shall be initiated within 7 days after reaching final grade or upon suspension of grading operations for anticipated duration of greater than 14 days or upon completion of grading operations for a specific area.
12. The contractor shall be responsible for preventing surface and air movement of dust from exposed soils which may present health hazards, traffic safety problems, or harm animal or plant life.
13. A Virginia Stormwater Management Program Permit (VSMP) for the discharge of stormwater from construction activities is required for projects disturbing 1 acre or greater. A VSMP is also required for projects disturbing 2,500 square feet or greater within Chesapeake Bay Preservation Area (CBPA); and those areas that are subject to more stringent requirements established by the local VESMP Authority.

STRUCTURAL PRACTICES - All erosion and sediment control practices shall meet or exceed the requirements and details of the latest edition of the **Virginia Stormwater Management Handbook, Chapter 7 - Design Specifications for Construction BMP's**. Additional erosion and sediment control modifications and measures may be required in the field as determined by E&S authority, the Town of South Hill, and/or their engineer/representative at no additional cost to the owner.

Temporary Construction Entrance (C-SCM-03)

A temporary stone construction entrance is a pad with a fabric filter liner underneath the stone located at points of vehicular ingress and egress on a construction site. There are several types of track-out controls that minimize the amount of sediment, such as dirt or mud, leaving or being tracked out from the construction site attached to vehicles.

Silt Fence (C-PCM-03)

Silt fence (and its derivatives wire-supported (reinforced) and super silt fence) is a temporary sediment barrier consisting of a synthetic filter fabric entrenched and stretched across and attached to supporting posts.

Storm Sewer Inlet Protection (C-SCM-04)

Inlet protection shall be installed on all culverts and/or storm sewer inlets affected by this project and/or indicated on this plan to prevent sediment run-off and depositing.

Topsoiling (C-SSM-02)

Best management practice (BMP) entails preserving and using the surface layer of undisturbed soil, often enriched in organic matter, to obtain a more desirable planting and growth medium and enhance final site stabilization

Soil Stabilization Blankets (C-SSM-05)

Soil stabilization blankets and matting are a form of protective blanket (Treatment 1) or soil stabilization matting (Treatment II) on a prepared planting area of a steep slope, channel, or shoreline. Blankest shall be installed per manufactures recommendations or per stapling diagrams illustrated within C-SSM-05-2 thru C-SSM-05-6.

Temporary Seeding (C-SSM-09)

Applies where exposed soil surfaces are not to be fine-graded for periods longer than 14 days. Such areas include bare areas, soil stockpiles, dikes, dams, sides of sediment basins, temporary road banks, non-vegetated cuts and fills, and diversions (see MS #1 and MS #2)

Permanent Seeding (C-SSM-10)

The establishment of perennial vegetative cover on disturbed areas by planting seed. (Permanent stabilized areas must meet the minimum requirements of MS #3) An establishment and persistence of 75 percent or more living overall perennial vegetation of the intended species mix and a maximum contiguous bare area of < 500 square feet is required to effectively limit sheet and rill erosion and permanently stabilize the soil surface.

TEMPORARY STABILIZATION

All areas disturbed by construction will be stabilized with temporary seeding and mulching where designated immediately following grading or in areas where construction grading will be inactive longer than 30 days (e.i. stock piles). Temporary seeding will comply with C-SSM-09-03 and Mulching shall comply with C-SSM-11 as outlined within the latest version of the Virginia Stormwater Management Handbook, Chapter 7 - Design Specifications for Construction BMP's, C-SSM-09 Temporary Seeding; see also tables below. Seeded areas will be maintained in keeping with accepted practices and care.

Temporary Seeding Schedule - Table C-SSM-09-3

Selection of the appropriate seed mixture will depend upon the time of year it is to be applied.

Time of Year	Mixture	Rate
Feb. 16 - Apr. 30	Annual Ryegrass	60 - 100 lbs/acre
May 1 - Aug. 31	German Millet	50 lbs/acre
Sept. 1 - Feb. 15	50/50 Mix Annual Ryegrass and Cereal (Winter) Rye	50 - 100 lbs/acre

Lime Schedule - Table C-SSM-09-02

pH Test	Recommended Application of Agricultural Limestone
below 4.2	3 tons per acre
4.2 - 5.2	2 tons per acre
5.2 - 6.0	1 ton per acre

Fertilizer Schedule

Apply 10-10-10 fertilizer at a rate of 450lbs/acre as based on soil testing

Mulch Material and Application Rates

Mulch	Rate Pre Acre	Per 1,000 ft2	Notes
Straw or Hay	1.5 to 2 tons	70 to 90 lbs.	Free from weeds and coarse matter. Must be anchored. Spread with mulch blower or by hand. Use a minimum of 2 tons per acre for winter cover
Fiber Mulch	1,500	35 lbs.	Do not use as mulch for winter cover or during hot, dry periods. Apply as slurry. When fiber mulch is the only available mulch during periods when straw should be used, apply at a minimum rate of 2000 lbs./acre or 45 lbs./1,000 ft2.
Corn Stalks	4 to 6 tons	185 to 275 lbs	Cut or shredded in 4- to 6-inch lengths. Air-dried. Do not use in fine turf areas. Apply with mulch blower or by hand.
Wood Chips	4 to 6 tons	185 to 275 lbs	Free of coarse matter. Air-dried. Treat with 12 lbs. nitrogen per ton. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.
Bark Chips or Shredded Bark	50 to 70 cy	1 to 2 cy	Free of coarse matter. Air-dried. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.

PERMANENT STABILIZATION

All areas disturbed by construction will be stabilized with permanent seeding and mulching immediately following finish grading. Seeding will comply with the latest version of the Virginia Stormwater Management Handbook, Chapter 7 - Design Specifications for Construction BMP's, C-SSM-10 Permanent Seeding. Soil samples shall be taken prior to permanent seeding to determine appropriate seed mixtures and fertilizer and lime quantities if needed. Restored areas will be maintained in keeping with accepted practices and care.

Permanent Seeding Schedule - Table C-SSM-10-7 Site Seeding Mixtures for **Piedmont Area**

Site Condition	Seed Mix		Application Rate (lbs / ac.)
Minimum-Care Lawn	Turf-Type Tall Fescue	95-100%	150 – 200
Commercial or Residential	Improved Perennial Ryegrass	0-5%	150 – 200
	Kentucky Bluegrass	0-5%	150 – 200
High-Maintenance Lawn	Improved (VCIA) Turf-Type Tall Fescue	100%	150 – 200
General Slope (3H:1V or less)	Tall Fescue***		50 – 75
	Red Top or Red/Hard Fescue		10 – 20
	White Clover and/or Birdsfoot Trefoil**		10 – 20
	Seasonal Nurse Crop*		30 – 40
Low-Maintenance Slope (> 3:1) or Inaccessible Area***	Tall Fescue		50 – 75
	Red Top and/or Hard Fescue		5 – 10
	White Clover and/or Birdsfoot Trefoil**		15 – 20
	Annual Lespedeza**		10 – 15
	Seasonal Nurse / Crop Cover		20 – 30

* Use seasonal nurse crop in accordance with seeding dates as stated below: February 16 through April annual rye

February 16 through April – annual/cereal rye

May 1 through August 15 – foxtail/German millet

August 16 through February 15 – annual/cereal rye

** Use legume seed that is properly inoculated with specified Rhizobia. Legumes recommended unless periodic N fertilization is intended. Weeping lovegrass may be added to any slope or low-maintenance mix during warmer seeding periods; add 10 to 20 lbs/acre in mixes.

*** Increase seeding rate if KY-31 is used rather than VCIA / VDOT improved varieties.

Bermudagrass can be added to substitute for Tall or Hard Fescue in the Low Maintenance mixes for the Southern Piedmont, particularly on sandy soils or hot (S and W) facing slopes. May through October, use hulled seed. All other seeding periods, use un-hulled seed.

Note: Seed mixes are suggested and subject to modification based on site-specific conditions by an agronomist or other qualified revegetation professionals. All seed rates expressed as PLS (Pure Live Seed; see Table C-SSM-10-9).

Lime Schedule - Table C-SSM-10-10

Ground Agricultural Limestone* (lbs./1,000 ft2) needed to Correct pH Level of Acid Soils to 6.5

	Soil Texture		
Existing pH	Sandy Loam	Loam	Clay Loam
6.2	20	35	40
6.0	40	55	70
5.8	55	65	85
5.6	70	80	105
5.4	90	100	125
5.2	105	120	140
5.0	120	140	160
4.8	125	180	205
4.6	155	210	230
4.0	200	250	300

Hydroseeding Schedule

Areas noted to be hydroseeded shall be done so in lieu of placing straw or hay mulch as noted below.

Apply Flexterra High Performance - Flexible Growth Medium (HP-FGM) mulch at a rate of 3,500lbs/acre. HP-FGM shall be as manufactured by Profile Products, Buffalo Grove, IL. HP-FGM shall be applied in accordance to manufacturer's recommendations.

VEGETATIVE PRACTICES

1. Seedbed Preparation

Permanent turf:

a) Remove rocks and debris that could interfere with tillage and the production of a uniform seedbed.
b) Loosen the subgrade immediately prior to spreading topsoil by disking or scarifying to a depth of at least 2 inches.
Track all slopes steeper than 4/1 with a dozer perpendicular to slope.
c) Apply lime and fertilizer at rates specified , unless determine otherwise by soil samples.
d) Disk or harrow and rake to produce a uniform and well-pulverized surface.
e) Apply seed at type and rate as specified.
f) Apply straw or hay mulch as specified. Crimp or tack straw on all slopes greater than 4:1. (Not required if area is hydroseeded)

1. Maintenance:

a) Refertilize in late winter or early spring the following year. Mow as required.
b) Keep mowed regularly to a height of 3-4 inches. Fertilize as noted belo.
c) Inspect and repair mulch and lining.

Post-Establishment Fertilization

- Begin fertilization of intensively managed/mowed cool-season grasses 90 days after planting to ensure proper stand and density. Begin fertilization of intensively managed/mowed warm-season grasses at 30 days after planting.
- Apply maintenance levels of fertilizer as determined by soil test. In the absence of a soil test, conduct fertilization as follows:

Cool-Season Grasses	4 lbs. nitrogen per 1,000 ft2 per year
	1 lb. phosphorus per 1,000 ft2 per year
	2 lbs. potash per 1,000 ft2 per year

- Apply 75 percent of the total requirements between September 1 and December 31. Apply the balance during the remainder of the year. Do not apply more than 1 lb. of soluble nitrogen per 1,000 ft2 at any one time.

Warm-Season Grasses

Apply 4 to 5 lbs. nitrogen per 1,000 ft2 per year between May 1 and August 15. Apply phosphorus and potash according to soil test.

Note: The use of slow-release fertilizer formulations for maintenance of turf is encouraged to reduce the number of applications and the impact on groundwater. Less intensive post-establishment fertilizer applications may be required for low-intensity un-mowed stands, particularly when at least 25% legumes are present. However, stand density and vigor should be evaluated periodically if lower fertilization rates are employed. Soil testing should be utilized for routine P and K prescriptions over time, but not for N recommendations. Maintenance of pH > 5.5 is essential for both grass and legume persistence in permanent seedings.

MANAGEMENT STRATEGIES

1. Construction should be sequenced so that grading operations can begin and end as quickly as possible.
2. Temporary seeding or other stabilization shall follow immediately after grading.
3. Areas, which are not to be disturbed, shall be clearly marked by flags, signs, etc.
4. The job superintendent shall be responsible for the installation and maintenance of all erosion and sediment control practices.

MAINTENANCE

In general, all erosion and sediment control measures will be checked weekly and after each significant rainfall. The following items will be checked in particular and repairs made immediately if needed:

1. The silt fence will be checked for sediment cleanout, undermining & deterioration.
2. All seeded areas will be checked to see that a good stand is maintained. Areas should be fertilized and reseeded as needed.
3. Silt fence and inlet protections shall be checked for sediment build up and cleaned out as accumulation occurs.
4. Slopes shall be checked for blanket matting failure, erosion, and stabilization.

CONSTRUCTION SCHEDULE

1. The plan approving authority must be notified one (1) week prior to the pre-construction conference, one (1) week prior to the commencement of land disturbing activity, and one (1) week prior to the final inspection.
2. Obtain site plan, E&S approval, and other applicable permits.

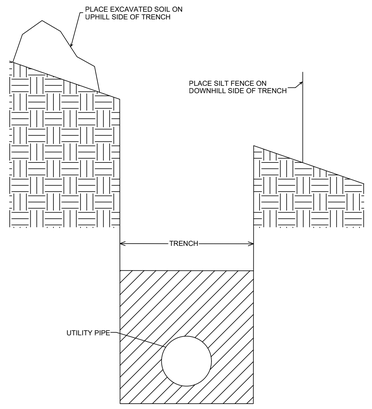
Phase I

3. Flag the work limits.
4. Install / mark construction entrance where indicated or required.
5. Install proposed storm sewer inlet as shown on Phase I plan & connect to existing storm system; install inlet protection.
6. Install silt fence as shown; only install silt fence as required for phase I pavement demo as stated in note 7.
7. Demo & remove pavement off site as required for building expansions only. Contractor to install any additional silt fence & o&s measures as dictated by site construction.
8. Begin building expansion construction.

Phase II

9. Install remainder of storm sewer & inlet protection.
10. Install utility lines to building expansions.
11. Begin pavement operations & grading. Contractor to install any additional E&S measures as dictated by site construction.
12. Apply blanket matting & temporary seeding to all banks, slopes, top of dam, etc. as required and stabilize disturbed areas.
13. Within 30 days upon completion of final site stabilization, remove all temporary erosion and sediment control measures, clean out all sediment deposits, and re-seed accordingly.

TRENCH EXCAVATION



SECTION VIEW

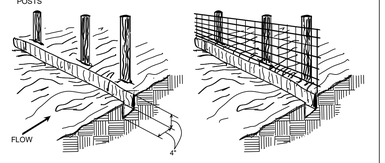
CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)

SF

C-PCM-04-3

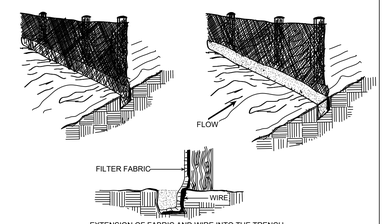
1. SET POSTS AND EXCAVATE A 4"X4" TRENCH UPSLOPE ALONG THE LINE OF POSTS

2. STAPLE WIRE FENCING TO THE POSTS.



3. ATTACH FILTER FABRIC TO WIRE FENCE AND EXTEND IT INTO TRENCH.

4. BACKFILL AND COMPACT THE EXCAVATED SOIL.

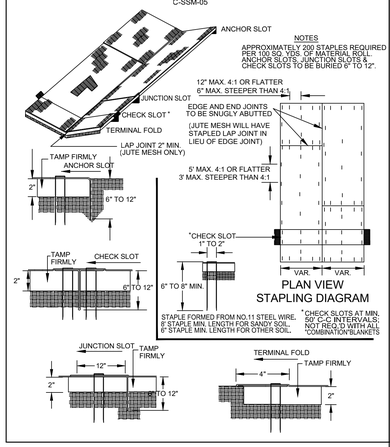


EXTENSION OF FABRIC AND WIRE INTO THE TRENCH.

TYPICAL TREATMENT - 1 (EC-2) (SOIL STABILIZATION BLANKET) INSTALLATION CRITERIA

B/M

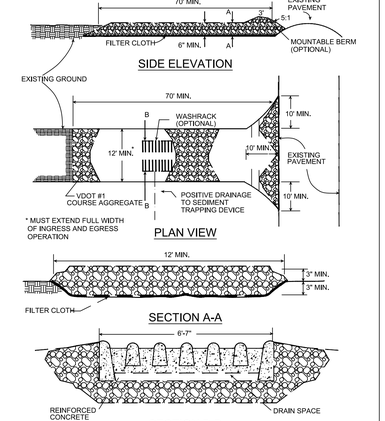
C-SSM-05



STONE CONSTRUCTION ENTRANCE

CE

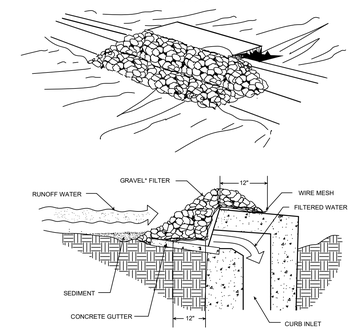
C-SCM-03



GRAVEL CURB INLET SEDIMENT FILTER

IP

C-SCM-04-5



SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE PONDING IN FRONT OF THE STRUCTURE IS NOT LIKELY TO CAUSE INCONVENIENCE OR DAMAGE TO ADJACENT STRUCTURES AND UNPROTECTED AREAS.

* GRAVEL SHALL BE VDOT #3, #357 OR 5 COARSE AGGREGATE.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

B&B Consultants, Inc.
Engineers-Planners
Surveyors-Lab Analysts

COMMONWEALTH OF VIRGINIA
SAMUEL PATRICK CARROLL
Lic. No. 046622
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

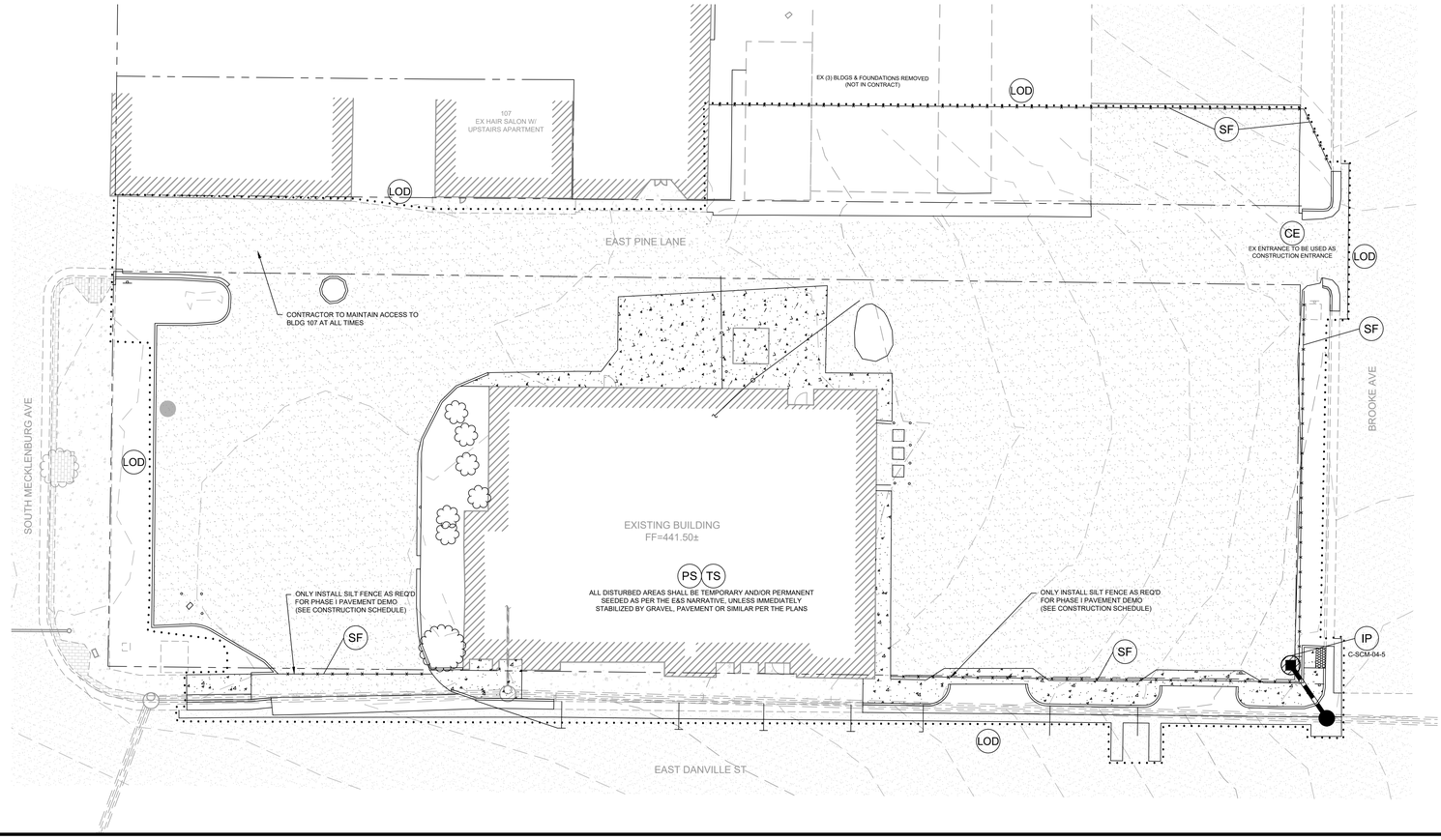
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS

DATE	DESCRIPTION

E&S CONTROL NARRATIVE & DETAILS

C-3.1



NORTH

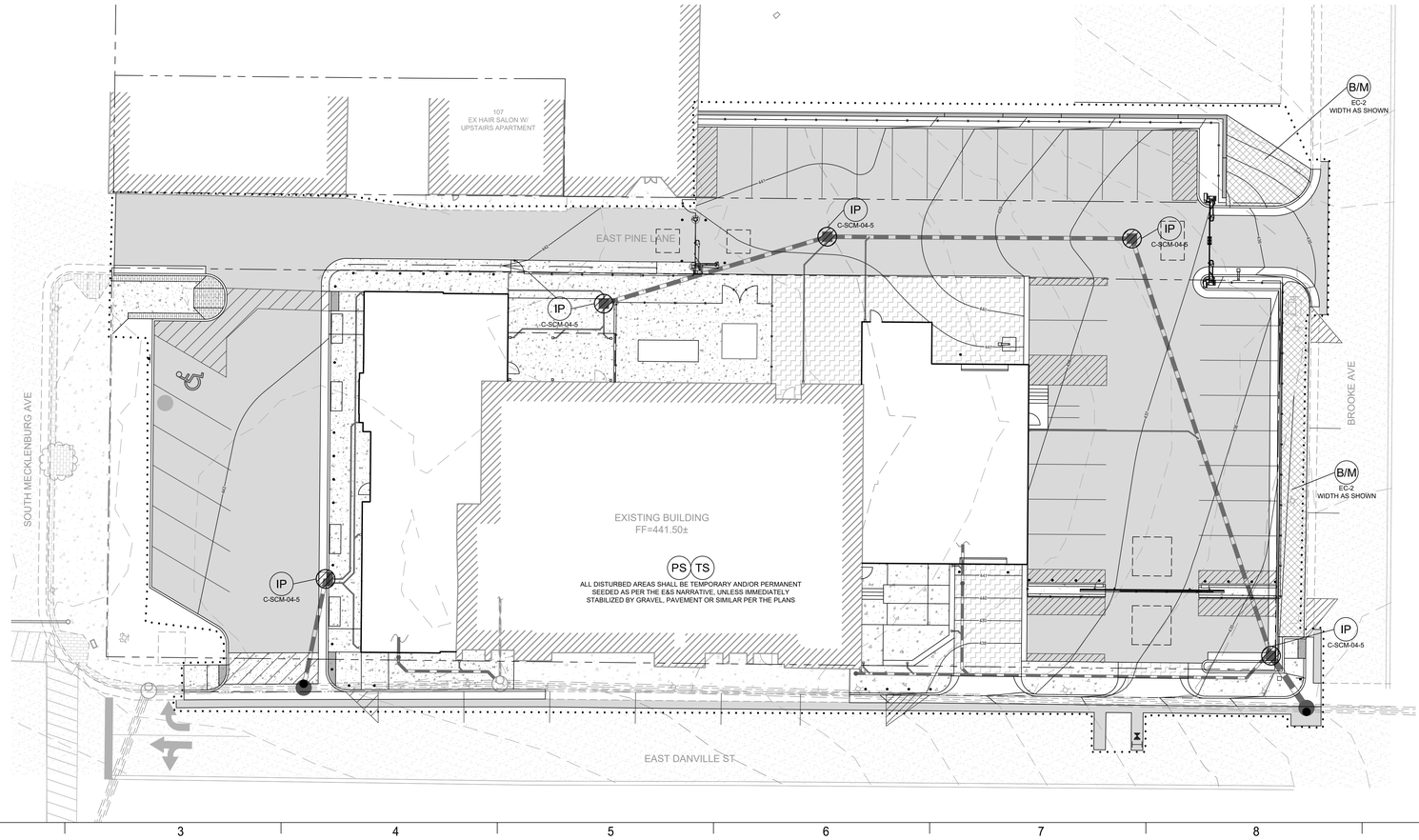
E&S CONTROL PLAN - PHASE I

0 7.5' 15' 30' 45'

SCALE: 1" = 15'

E&S LEGEND

- SF — SILT FENCE
- CE — TEMPORARY CONSTRUCTION ENTRANCE
- IP — STORM DRAIN INLET PROTECTION (TYPE SPECIFIED ON PLANS)
- B/M — SOIL STABILIZATION BLANKETS & MATTING (TYPE SPECIFIED ON PLANS)
- TS — TEMPORARY SEEDING
- PS — PERMANENT SEEDING
- LOD — LIMITS OF DISTURBANCE



NORTH

E&S CONTROL PLAN - PHASE II

0 7.5' 15' 30' 45'

SCALE: 1" = 15'

Moseley

3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

B&B Consultants, Inc.
Engineers-Planners
Surveyors-Lab Analysts

COMMONWEALTH OF VIRGINIA
SAMUEL PATRICK CARROLL
Lic. No. 046622
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

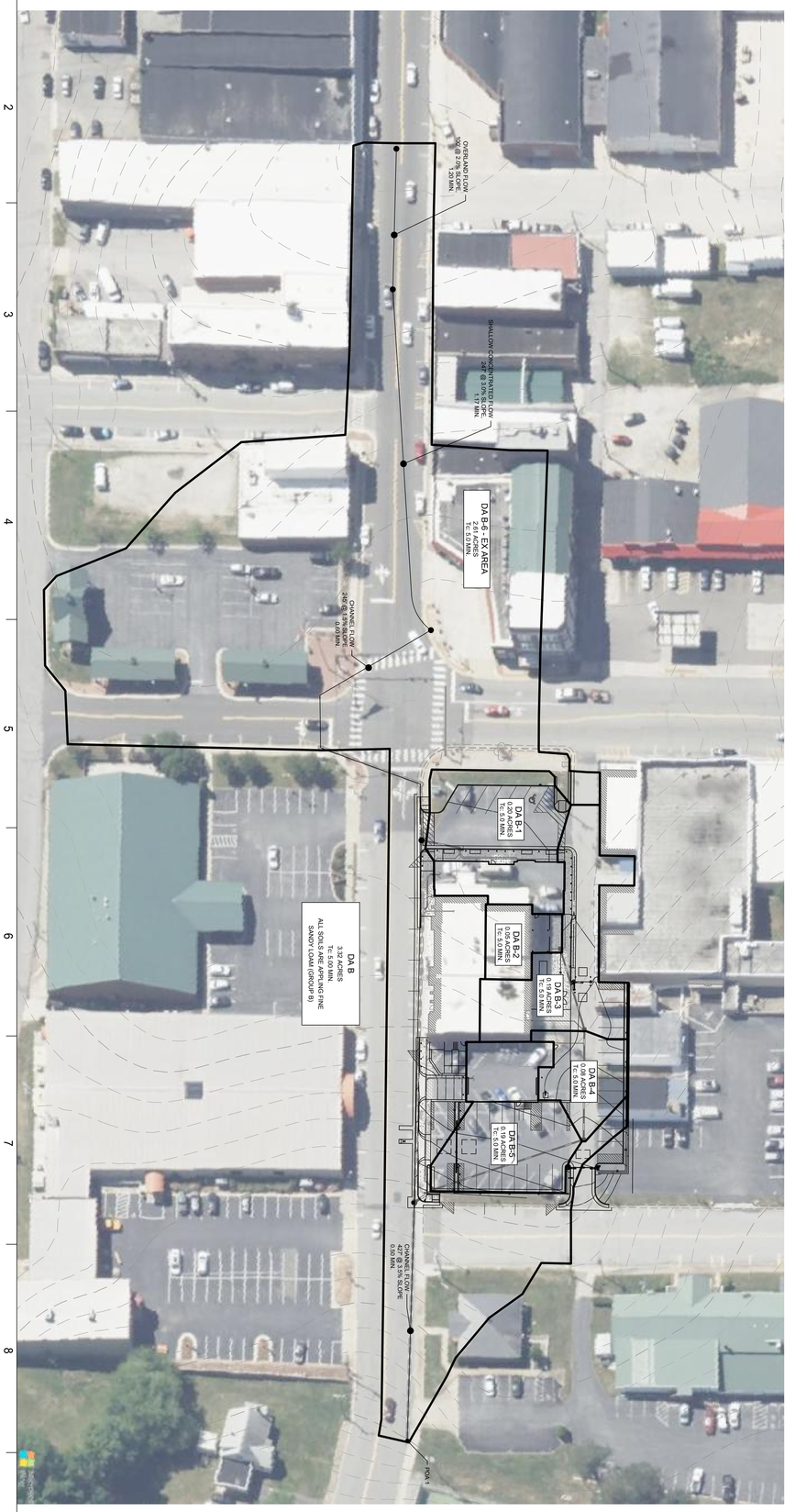
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS

DATE	DESCRIPTION

E&S CONTROL PLAN

C-3.2



POST-DEVELOPMENT DRAINAGE DIVIDE MAP

SCALE: 1" = 40'

NORTH



PRE-DEVELOPMENT DRAINAGE DIVIDE MAP

SCALE: 1" = 40'

NORTH

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO. 66103 DATE: OCTOBER 21, 2025
SUBMITTAL: BID SET

REVISIONS
DATE DESCRIPTION

DRAINAGE DIVIDE MAPS

C-4.1

DIGITAL SIGNATURE LOCATION

COMMONWEALTH OF VIRGINIA
SAMUEL PATRICK CARROLL
Lic. No. 046622
PROFESSIONAL ENGINEER
10/21/26

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

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Notes for Crosswalk Closures and Pedestrian Detours (Figure TTC-36.0) *(MUTCD TA-29)*

Standard:

1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.
2. Curb parking shall be prohibited for at least 50 feet in advance of the midblock crosswalk.
3. SIDEWALK CLOSED CROSS HERE signs shall include audible information devices to provide adequate communication to pedestrians with vision disabilities.
4. Audible information devices shall be provided where midblock sidewalk closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians with vision disabilities.
4a. All sidewalk closures shall be closed with pedestrian channelizing devices.
4b. Fluorescent yellow-green PEDESTRIAN TRAFFIC (W11-2) symbol sign, AHEAD (W16-9p) plaque and ARROW (W16-7p) plaque shall be used to identify the work zone crosswalk.
4c. Temporary midblock crossings shall be established via an engineering study per the latest effective revision to IIM-TE-384.

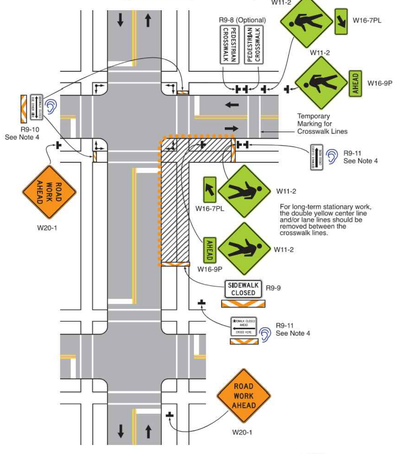
Guidance:

5. Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.
5a. Temporary markings should be considered for operations exceeding three days in duration.

Option:

6. Street lighting may be considered.
7. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
8. For nighttime closures, Type A Flashing warning lights may be used on barricades supporting signs and closing sidewalks.
9. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the work space from vehicular traffic.
10. In order to maintain the systematic use of the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs in a jurisdiction, the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.
11. Positive protection devices may be used per Section 6M.02.

Crosswalk Closures and Pedestrian Detours
Figure TTC-36.0 *(MUTCD TA-29)*



Note: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6P-V3 for sign spacing requirements ("A").
See Tables 6P-V5 through 6P-V7 for taper length requirements.
See Table 6P-V8 for channelizing device spacing requirements.

Legend
Temporary Audible Information Device

Notes for Stationary Work on a Shoulder (Figure TTC-4.0) *(MUTCD TA-3)*

Guidance:

1. [Paragraph Deleted]

Standard:

1a. For long-term stationary work (more than 3 days) on divided highways having a median wider than 8 feet, sign assemblies on both sides of the roadway shall be required as shown (ROAD WORK AHEAD (W20-1), RIGHT SHOULDER CLOSED AHEAD (W21-5bR), RIGHT SHOULDER CLOSED (W21-5aR)), even though only one shoulder is being closed.

Option:

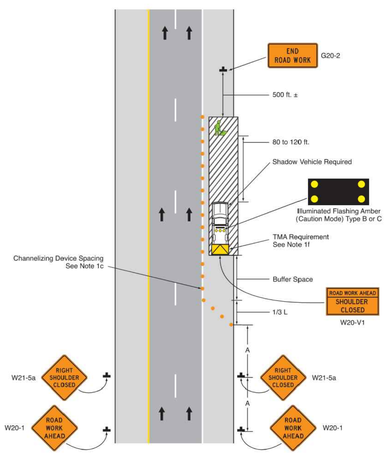
1b. Sign assemblies on the side opposite the shoulder closure may be may be omitted if the operation will be 3 days or less in duration.
2. [Paragraph Deleted]
3. [Paragraph Deleted]
4. The SHOULDER WORK (W21-5) sign on an intersecting roadway may be omitted where drivers emerging from that roadway will encounter another advance warning sign prior to this activity area.
5. [Paragraph Deleted]
6. [Paragraph Deleted]

Standard:

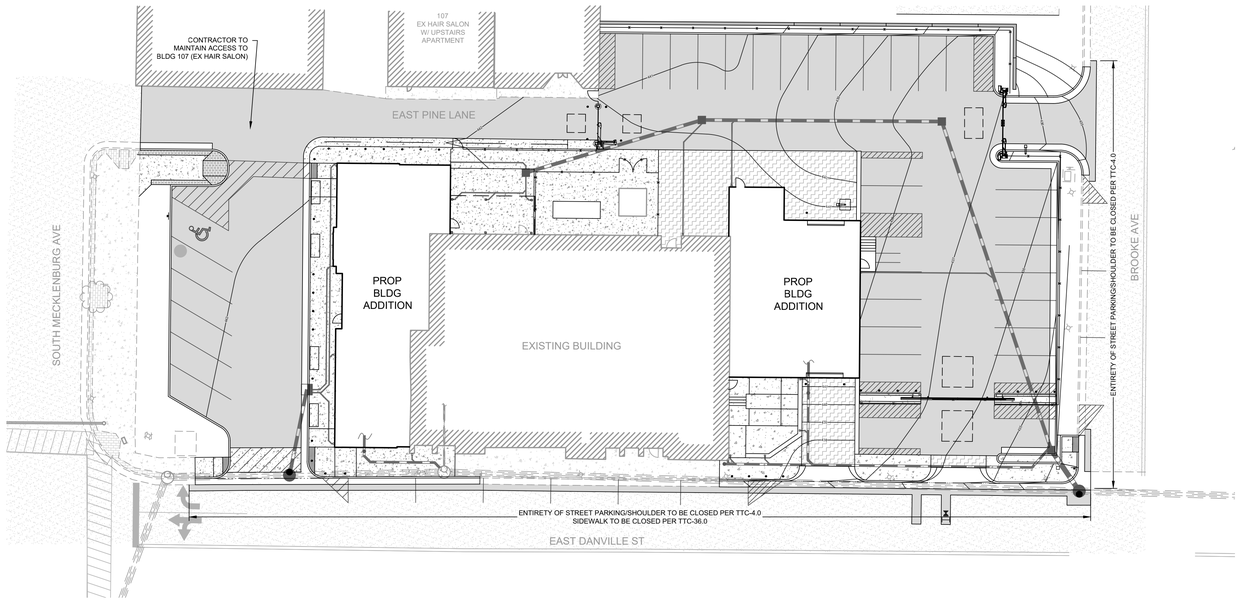
7. [Paragraph Deleted]
8. [Paragraph Deleted]
9. See Table 6P-V5 for Taper Lengths and Table 6P-V8 for channelizing device spacing.
10. On roadways with paved shoulders having a width of 8 feet or more, channelizing devices shall be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
11. The buffer space length shall be as shown in Table 6P-V4 for the posted speed limit.
12. A truck-mounted attenuator (TMA) shall be used on the shadow vehicle on Limited Access highways and multi-lane roadways with posted speed limit equal to or greater than 45 mph for operations with a duration greater than 60 minutes.
13. When a side road intersects the highway within the temporary traffic control zone, additional traffic control devices shall be placed as needed.

Known Error (VDOT)

Stationary Work on a Shoulder
Figure TTC-4.0 *(MUTCD TA-3)*



Note: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6P-V3 for sign spacing requirements ("A").
See Tables 6P-V5 through 6P-V7 for taper length requirements.
See Table 6P-V8 for channelizing device spacing requirements.



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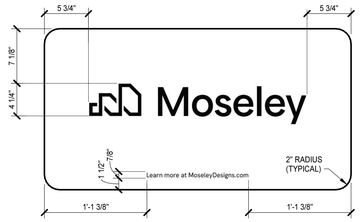
MOT/TTC PLAN

C-5.1



TEXT LAYOUT ELEVATION

1 1/2" = 1'-0"



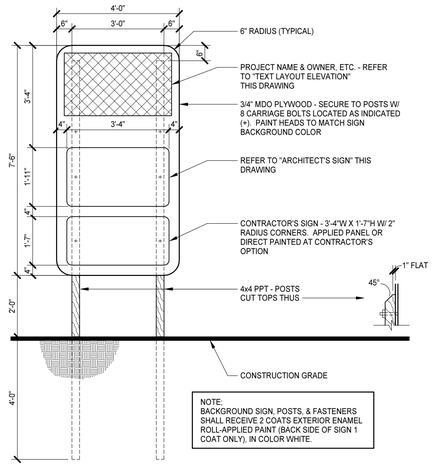
SIZE: 1'-9" VERTICAL x 3'-4" HORIZONTAL

NOTES:
"MOSELEY" TEXT IN LOGO IS NOT A FONT. IMAGE SEEN MUST BE USED.

FONT FOR "LEARN MORE AT MOSELEY DESIGNS.COM" IS HANKEN GROTESK (REGULAR) AT 60 POINT.

ARCHITECT'S SIGN

1 1/2" = 1'-0"



PROJECT SIGN ELEVATION

1/2" = 1'-0"

ARCHITECTURAL ABBREVIATIONS

A-PT	ACCENT PAINT
ABS	AIR BARRIER SYSTEM
ABV	ABOVE
ACP	ACOUSTICAL CEILING PANEL
ACT	ACOUSTICAL CEILING TILE
ACW	ALUMINUM CLAD WINDOW
ADJ	ADJUSTABLE
AED	AUTOMATED EXTERNAL DEFIBRILLATOR
AFF	ABOVE FINISHED FLOOR
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
ALUM	ALUMINUM
AP	ACCESS PANEL
APC	ARCHITECTURAL PRECAST CONCRETE
ARC	ABUSE RESISTANT COATING
AS	ALUMINUM STOREFRONT
AUTO	AUTOMATIC
AVG	AVERAGE
AW	ALUMINUM WINDOW
AWC	ACOUSTICAL WALL COVERING
AWP	ACOUSTICAL WALL PANEL
BD	BOARD
BF	BARRIER FREE (ADA or A117.1)
BLDG	BUILDING
BLKG	BLOCKING
BOT	BOTTOM
BRG	BEARING
BTWN	BETWEEN
BUR	BUILT-UP ROOF
C	CARPET
C-TILE	CARPET TILE
CAB	CABINET
CB	CHALKBOARD
CCD	COILING COUNTER DOOR
CCTV	CLOSED CIRCUIT TELEVISION
CEM	CEMENT
CFSF-NS	COLD FORMED STEEL FRAMING, NON-STRUCTURAL
CFSF-S	COLD FORMED STEEL FRAMING, STRUCTURAL
CG	CORNER GUARD
CI	CONTINUOUS INSULATION
CIPC	CAST IN PLACE CONCRETE
CJ	CONTROL JOINT
CL	CLOSET
CLG	CEILING
CLR	CLEAR
CM	CENTIMETER
CMBD	CEMENT BOARD
CMU	CONCRETE MASONRY UNIT
CMU-A	CONCRETE MASONRY UNIT - ACOUSTICAL
CMU-GF	CONCRETE MASONRY UNIT - GROUND FACE
CMU-GLZ	CONCRETE MASONRY UNIT - GLAZED
CMU-SPLF	CONCRETE MASONRY UNIT - SPLIT FACE
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
CONC-LH	CONCRETE WITH LIQUID HARDENER/SEALER
CONC-PMT	CONCRETE WITH PIGMENT
CONC-POL	CONCRETE - POLISHED
CONC-SLR	CONCRETE WITH CURE & SEAL
CONC-ST	CONCRETE WITH STAIN
CONST	CONSTRUCTION
CONT	CONTINUOUS
CONTR	CONTRACTOR
CORR	CORRIDOR
CSMU	CAST STONE MASONRY UNIT
CT	CERAMIC TILE
CTSK	COUNTERSINK, COUNTERSUNK
CU FT	CUBIC FEET / FOOT
CUST	CUSTODIAN / CUSTODIAL
CW	ALUMINUM CURTAIN WALL
CWFD	CEMENTITIOUS WOOD FIBER DECK
D	DEPTH/DEEP
DBL	DOUBLE
DEMO	DEMOLITION
DETE	DETENTION
DF	DRINKING FOUNTAIN
DG	DOOR GRILLE
DHM	DETENTION HOLLOW METAL
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DIV	DIVISION
DL	DOOR LOUVER
DN	DOWN
DP	DAMPPROOFING
DR	DISPLAY RAIL
DS	DOWNSPOUT
DTL	DETAIL
DWG	DRAWING
DWR	DRAWER
EA	EACH
EF	EXHAUST FAN
EFS	EXTERIOR FINISH SYSTEM
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELEVATION
ELAS	ELASTOMERIC
ELEC	ELECTRICAL
ELEV	ELEVATOR
EMER	EMERGENCY
EPS	EXPANDED POLYSTYRENE
EPX	EPOXY
EQ	EQUAL
EQUIP	EQUIPMENT
ETR	EXISTING TO REMAIN
EVCT	ENHANCED VINYL COMPOSITION TILE
EWC	ELECTRIC WATER COOLER
EX	EXISTING
EXH	EXHAUST
EXP	EXPANSION
EXPC	EXPOSED CONSTRUCTION
EXT	EXTERIOR
FAAF	FLUID APPLIED ATHLETIC FLOORING
FD	FLOOR DRAIN
FDN	FOUNDATION
FE	FIRE EXTINGUISHER
FEB	FIRE EXTINGUISHER BRACKET
FEC	FIRE EXTINGUISHER CABINET
FF	FINISHED FLOOR
FGL	FIBERGLASS
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHVC	FIRE HOSE VALVE CABINET
FIN	FINISHED
FLR	FLOOR
FLRG	FLOORING
FO	FACE OF
FRM	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FRT	FIRE RETARDANT TREATED
FT	FOOT, FEET
FTG	FOOTING
FURN	FURNITURE
FVC	FIRE VALVE CABINET
FWC	FABRIC WALL COVERING
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GYPSUM BOARD
GB-AR	GYPSUM BOARD - ABUSE RESISTANT
GB-IR	GYPSUM BOARD - IMPACT RESISTANT
GB-S	GYPSUM BOARD - SECURITY
GFRC	GLASS FIBER REINFORCED CONCRETE
GFRG	GLASS FIBER REINFORCED GYPSUM
GL	GLASS, GLAZING
GL-BLK	GLASS BLOCK
GPM	GALLONS PER MINUTE
GRT	GROUT
GSFT	GLAZED STRUCTURAL FACING TILE
GT	GLASS TILE
GWT	GLAZED WALL TILE
GYP	GYPSUM
H	HIGH
HB	HOSE BIBB
HBD	HARDBOARD
HDC	HOLD DOWN CLIPS
HDNR	HARDENER
HDWD	HARDWOOD
HDWR	HARDWARE
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HPC	HIGH PERFORMANCE COATINGS
HPFP	HIGH PERFORMANCE FLOOR PAINT
HT	HEIGHT
HVAC	HEATING, VENTILATING, AIR CONDITIONING
ID	INSIDE DIAMETER
IN	INCH, INCHES
INCL	INCLUDE, INCLUDING
INFO	INFORMATION
INST	INSTALLATION
INSUL	INSULATION
INT	INTERIOR
IRWC	IMPACT RESISTANT WALL COVERING
IWB	INTERACTIVE WHITE BOARD
JAN	JANITOR
JCT	JUNCTION
JT	JOINT
L	LENGTH/LONG
LAB	LABORATORY
LAHJ	LOCAL AUTHORITY HAVING JURISDICTION
LAM	LAMINATE
LAV	LAVATORY
LH	LEFT HAND
LIN	LINOLEUM
LKR	LOCKER
LMC	LINEAR METAL CEILING
LPS	LAMINATE PANEL SYSTEM
LT	LIGHT
LVR	LOUVER
M	METER
MACH	MACHINE
MAS	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
MB	MARKERBOARD
MCM	METAL COMPOSITE MATERIAL
MCP	METAL CEILING PANEL
MDO	MEDIUM DENSITY OVERLAY
MECH	MECHANICAL
MED	MEDIUM
MEMB	MEMBRANE
MFR	MANUFACTURER
MIF	MULTICOLOR INTERIOR FINISHING
MIN	MINIMUM
MIR	MIRROR
MISC	MISCELLANEOUS
MLDG	MOLDING
MO	MASONRY OPENING
MPS	MANUAL PROJECTION SCREEN
MR	MAP RAIL
MT	MOUNT
MTD	MOUNTED
MTL	METAL
NA	NOT APPLICABLE
NIC	NOT IN CONTRACT
NO.	NUMBER
NOM	NOMINAL
NRC	NOISE REDUCTION COEFFICIENT
NTS	NOT TO SCALE
OC	ON CENTER
OCD	OVERHEAD COILING DOOR
OCG	OVERHEAD COILING GRILLE
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OPNG	OPENING
OPP HD	OPPOSITE HAND
OVHD	OVERHEAD
P-TILE	PORCELAIN TILE
PC	PRECAST
PERF	PERFORATED, PERFORATION(S)
PERIM	PERIMETER
PIP	POURED IN PLACE
PLAM	PLASTIC LAMINATE
PLAS	PLASTER
PLYWD	PLYWOOD
PNL	PANEL, PANELING
POLY	POLYETHYLENE
PPS	POWER PROJECTION SCREEN
PPT	PRESSURE- OR PRESERVATIVE-TREATED
PR	PAIR
PREFAB	PREFABRICATED
PREFIN	PREFINISHED
PREP	PREPARE / PREPARATION
PS	PROJECTION SCREEN
PSB	PENCIL SHARPENER BLOCK
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	PAINT
PTN	PARTITION
PTS	PNEUMATIC TUBE SYSTEM
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PVWC	PERFORATED VINYL WALL COVERING
QCT	QUARTZ COMPOSITION TILE
QSM	QUARTZ SURFACING MATERIAL
QT	QUARRY TILE
QTY	QUANTITY
R	RISER, RADIUS
R/W	RIGHT OF WAY
RAD	RADIUS
RAF	RESILIENT ATHLETIC FLOORING
RB	RESILIENT BASE
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
REFG	REFRIGERATOR
REINF	REINFORCING, REINFORCE(D)
REM	RECESSED ENTRY MAT
REQ'D	REQUIRED
RES	RESINOUS FLOORING
RET	RESILIENT ECO TILE
RFT	RUBBER FLOOR TILE
RH	RIGHT HAND
RL	RAIN LEADER
RM	ROOM
RO	ROUGH OPENING
RSF	RUBBER SHEET FLOORING
RSR	RESILIENT STAIR RISER
RST	RESILIENT STAIR TREAD
RT	RIGHT
RTU	ROOFTOP UNIT
SAB	SOUND ATTENUATION BLANKET
SC-PLK	SECURITY CEILING PLANK
SC-PNL	SECURITY CEILING PANEL
SCH	SCHEDULE
SD	SECTIONAL DOOR
SF	SQUARE FEET / FOOT
SFRM	SPRAYED FIRE RESISTANT MATERIAL
SHM	SECURITY HOLLOW METAL
SHTG	SHEATHING
SIM	SIMILAR
SPEC	SPECIFICATION
SPF	SPRAYED POLYURETHANE FOAM
SPR	SPRINKLER
SQ	SQUARE
SQ FT	SQUARE FEET / FOOT
SRD	SECONDARY ROOF DRAIN
SS	STAINLESS STEEL
SSM	SOLID SURFACE MATERIAL
ST	STREET
STC	SOUND TRANSMISSION COEFFICIENT
STD	STANDARD
STL	STEEL
STN	STONE
STRUCT	STRUCTURAL
SUSP	SUSPENDED
SV	SHEET VINYL
SWM	SECURITY WOVEN MESH / WOVEN ROD
SYM	SYMMETRICAL
T	TREAD
T&G	TONGUE & GROOVE
T.O.	TOP OF
TB	TACKBOARD
TCF	TEXTILE COMPOSITE FLOORING
TEL	TELEPHONE
TERR-C	TERRAZZO CEMENTITIOUS
TERR-E	TERRAZZO EPOXY
TERR-R	TERRAZZO RUBBERIZED
THHD	THRESHOLD
THK	THICKNESS, THICK
TOS	TOP OF STEEL
TOW	TOP OF WALL
TS	TACK STRIP
TV	TELEVISION
TYP	TYPICAL
UC	UNDERCUT
UG	UNDERGROUND
UH	UNIT HEATER
UNO	UNLESS NOTED (INDICATED) OTHERWISE
VAT	VINYL ASBESTOS TILE
VB	VAPOR BARRIER
VCT	VINYL COMPOSITION TILE
VDB	VISUAL DISPLAY BOARD
VERT	VERTICAL
VEST	VESTIBULE
VFCT	VINYL FREE COMPOSITION TILE
VFWC	VINYL FREE WALLCOVERING
VIF	VERIFY IN FIELD
VR	VAPOR RETARDER
VT	VINYL TILE
VTR	VENT THROUGH ROOF
VW	VINYL WINDOW
VWC	VINYL WALL COVERING
W	WIDE, WIDTH
W/	WITH
W/O	WITHOUT
WC	WATER CLOSET
WCP	WOOD CEILING PANEL
WD	WOOD
WDW	WINDOW
WP	WATERPROOFING
WPT	WORKING POINT
WSCT	WAINSCOT
WSF	WOOD SPORTS FLOORING
WT	WEIGHT
WVWC	WOOD VENEER WALL COVERING
WWF	WELDED WIRE FABRIC
XPS	EXTRUDED POLYSTYRENE

KEYNOTES

n — KEYNOTE (1 TO 2 DIGITS)

nnn — KEYNOTE (3 DIGITS ONLY)

n n/n" — SIZE: THICKNESS; OR OTHER DESCRIPTIVE INFORMATION

1. KEYNOTES ARE GENERALLY ASSOCIATED WITH A SERIES OF DRAWINGS (e.g., A6.2.X, A3.1.X); THEREFORE KEYNOTE NUMBERS FROM SERIES TO SERIES WILL VARY (i.e., KEYNOTE NO. 1 IN THE A6.2.X SERIES WILL BE DIFFERENT FROM KEYNOTE NO. 1 IN THE A3.1.X SERIES).

ARCHITECTURAL GRAPHIC SYMBOL LEGEND

REFER TO A7.0.1 FOR FINISH SCHEDULE — SUPERVISOR'S OFFICE / A101 / 100 SF
- SPACE
- SPACE NAME
- SPACE NUMBER
- SQUARE FOOTAGE, IF INDICATED
- BUILDING "PART" NUMBER IN MULTI-PART BUILDING

REFER TO A6.1.1 FOR SCHEDULE — A101C / 60
- DOOR
- FIRE RATING IN MINUTES (IF INDICATED)
- DOOR SUFFIX LETTER WHEN MORE THAN ONE DOOR PER SPACE
- SPACE NUMBER

REFER TO A6.1.X FOR TYPES — STL 1.1 — STEEL FRAME NUMBER

REFER TO A6.1.X FOR TYPES — AW 1.1 — ALUMINUM WINDOW NUMBER

REFER TO A6.1.X FOR TYPES — AS 1.1 — ALUMINUM STOREFRONT NUMBER

REFER TO A6.1.X FOR TYPES — VW 1.1 — VINYL WINDOW NUMBER

REFER TO A6.1.X FOR TYPES — CW 1.1 — CURTAIN WALL NUMBER

REFER TO A6.1.X FOR TYPES — LVR 1.1 — LOUVER NUMBER

REFER TO A6.1.X FOR TYPES — GBLK 1.1 — GLASS BLOCK NUMBER

REFER TO A0.1.2 FOR LEGEND — JOINT

REFER TO A0.1.2 FOR LEGEND
- WALL PARTITION TYPE — Xh-n
- FIRE RESISTANCE RATING IN HOURS
- WALL PARTITION TYPE — Xh-XX
- SB=SMOKE BARRIER SP=SMOKE PARTITION IU=INCIDENTAL USE

REFER TO A7.3.1 FOR ELEVATIONS — 9 A8.3 / 10 A8.1
- INTERIOR ARCHITECTURAL WOODWORK (CASEWORK) ELEVATION

REFER TO A1.3.1 FOR LEGEND — RFAn — ROOF ASSEMBLY

REFER TO G1.4.1 FOR LEGEND — Xn — FIRE-RATED ASSEMBLY

REFER TO A3.1.1 FOR LEGEND — WAn — WALL ASSEMBLY

REFER TO A0.2.1 FOR LEGEND — SW-n — SITE WALL ASSEMBLY

REFER TO A5.1.1 FOR LEGEND — TAn — TOILET ASSEMBLY

REFER TO A6.1.2 FOR LEGEND — n — GLAZING/GLASS TYPES

1T — EQUIPMENT TYPE

N — PLAN NORTH

TRUE NORTH ARROW

MATCH LINE

WPT — WORKING POINT

DATUM POINT

℄ — CENTERLINE

℄ — PLATE

FEC — SURFACE MOUNT FEC: BOTTOM OF CABINET AT 2'-2" AFF

FEC — SEMI-RECESSED FEC: T.O. MASONRY OR ROUGH OPENING AT 4'-8" AFF

FEC — FULLY-RECESSED FEC: T.O. MASONRY OR ROUGH OPENING AT 4'-8" AFF

FEB — BRACKET: MOUNT BRACKET AT 3'-8" AFF

1 / A2.1 — WALL OR MISC SECTION WHERE CUT
- WALL SECTION NUMBER
- DRAWING NUMBER WHERE WALL SECTION IS INDICATED

1 / A2.1 — DETAIL OR ENLARGED PLAN WHERE CUT
- DETAIL OR ENLARGED PLAN NUMBER
- DRAWING NUMBER WHERE DETAIL OR ENLARGED PLAN IS INDICATED

1 / A2.1 — 1 / A2.1 — BUILDING SECTION WHERE CUT
- SECTION NUMBER
- DRAWING NUMBER WHERE SECTION IS INDICATED

1 / 2 A7.1 4 / 3 — 1 / A7.1 — INTERIOR OR EXTERIOR ELEVATION WHERE CUT
- ELEVATION NUMBER
- DRAWING NUMBER WHERE ELEVATION IS INDICATED
- MULTIPLE ELEVATIONS

PLAN TITLE

1/8"=1'-0"

A ELEVATION OR BUILDING SECTION TITLE

A2.0.1 A4.1 A2.0.2 A2.0.3 — 1/4"=1'-0"
- ELEVATION OR BUILDING SECTION LETTER
- DRAWING NUMBER WHERE ELEVATION OR BUILDING SECTION IS INDICATED
- DRAWING NUMBER WHERE ELEVATION OR BUILDING SECTION IS CUT
- ADDITIONAL DRAWING NUMBERS WHERE ELEVATION OR BUILDING SECTION IS CUT

1 ENLARGED PLAN OR WALL SECTION TITLE

A2.1 A7.1 A2.3 A2.6 — 1/4"=1'-0"
- ENLARGED PLAN OR WALL SECTION NUMBER
- DRAWING NUMBER WHERE ENLARGED PLAN OR WALL SECTION IS INDICATED
- DRAWING NUMBER WHERE ENLARGED PLAN OR WALL SECTION IS CUT
- ADDITIONAL DRAWING NUMBERS WHERE ENLARGED PLAN OR WALL SECTION IS CUT

3 DETAIL TITLE

A5.1 A5.2 A5.3 A5.7 — 1/2"=1'-0"
- DETAIL NUMBER OR LETTER
- DRAWING NUMBER WHERE DETAIL IS INDICATED
- DRAWING NUMBER WHERE DETAIL IS CUT
- ADDITIONAL DRAWING NUMBERS WHERE DETAIL IS CUT

1 CASEWORK TITLE

1/4"=1'-0"
- CASEWORK ELEVATION NUMBER

1 / A — STRUCTURAL GRID LINE WITH DESIGNATIONS

EX1 / EXA — EXISTING STRUCTURAL GRID LINE WITH DESIGNATIONS

DETENTION SYMBOL LEGEND

XX — DETENTION WINDOW; FRAME NUMBER INDICATES ROOM SIDE WHERE GLAZING STOP IS LOCATED; REFER TO DETENTION WINDOW SCHEDULE IN THE A6.3.X SERIES DRAWINGS FOR ADDITIONAL INFORMATION.

Dx — DETENTION EQUIPMENT ITEM; REFER TO DETENTION EQUIPMENT SCHEDULE ON DRAWING A6.X.X.

ARCHITECTURAL GENERAL NOTES

A. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.

B. ELEMENTS THAT ARE IDENTIFIED BY OTHER DISCIPLINES (e.g., CIVIL, STRUCTURAL, PLUMBING, FIRE PROTECTION, MECHANICAL, ELECTRICAL) ELSEWHERE WITHIN THE ARCHITECTURAL SERIES OF DRAWINGS AND/OR SPECIFICATIONS, OR IDENTIFIED OR COVERED BY DEFAULTS (e.g., SIZES, THICKNESS, SPACING, MATERIALS) IN THE SPECIFICATIONS MAY NOT BE ANNOTATED (NOTE OR KEYNOTED) ON THESE DRAWINGS.

C. ELEMENTS IDENTIFIED IN "LEGENDS" AND/OR "GENERAL NOTES" MAY NOT BE NOTED IN DETAILS, OR SECTIONS, AS THESE ELEMENTS ARE IDENTIFIED IN THE LEGENDS (e.g. FACE BRICK, CMU, WINDOWS)

D. REFER TO "ASSEMBLIES" FOR MATERIALS AND COMPONENTS THAT MAKE UP THAT PARTICULAR ASSEMBLY (e.g., EXTERIOR WALL ASSEMBLIES, ROOF ASSEMBLIES, AND FIRE-RATED ASSEMBLIES). ONCE A PARTICULAR ASSEMBLY HAS BEEN IDENTIFIED ON ONE DRAWING, THAT SAME ASSEMBLY GRAPHIC SHALL APPLY TO ALL OTHER SIMILAR LOCATIONS UNLESS SPECIFICALLY INDICATED OTHERWISE. PROVIDE THAT SAME ASSEMBLY AT THE SIMILAR LOCATION WHETHER THE ASSEMBLY GRAPHIC SYMBOL IS SHOWN OR NOT.

E. VERIFY ALL DIMENSIONS, INCLUDING DIMENSIONS ON STRUCTURAL DRAWINGS AND OTHER ARCHITECTURAL DRAWINGS. IMMEDIATELY NOTIFY ARCHITECT OF ANY DISCREPANCIES.

F. PROVIDE CONCRETE HOUSEKEEPING PADS FOR ALL EQUIPMENT INDICATED TO BE MOUNTED OR OTHERWISE REQUIRED TO BE MOUNTED TO THE FLOOR. WHERE PADS ARE NOT SHOWN, PROVIDE 6" THICK CONCRETE PADS W/ 3/4" CHAMFERED EDGES (ALL SIDES). REINFORCE WITH MESH EQUIVALENT TO FLOOR SLAB REINFORCING REQUIREMENTS.

ARCHITECTURAL MATERIALS LEGEND

- EARTH
- POROUS FILL
- CONCRETE
- FACE BRICK
- SPLIT-FACE BLOCK
- CONCRETE MASONRY UNIT
- GROUTED SOLID CONCRETE MASONRY UNIT

NOTE: PROVIDE 100% SOLID, PLANT-CAST UNITS WHERE CORE HOLES WOULD BE VISIBLE WITHIN FINISH SPACE (E.G., WINDOW SILLS)

- ARCHITECTURAL PRECAST CONCRETE
- CAST STONE MASONRY
- RIGID INSULATION
- BATT INSULATION
- SPRAYED POLYURETHANE FOAM
- WOOD SHIM
- WOOD BLOCKING - CONTINUOUS
- FINISHED WOOD
- PLYWOOD
- GYPSUM BOARD / SHEATHING
- STONE
- MINERAL WOOL

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026

SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

GENERAL ARCHITECTURAL INFORMATION

A0.1.1

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TERMINATION GENERAL NOTES

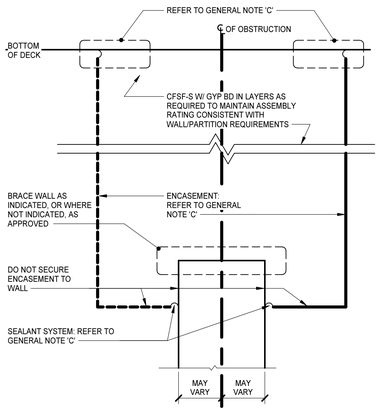
A. AT FIRE-, SMOKE-, AND ACOUSTICALLY RATED WALLS: SEAL ALL NON-OBSTRUCTED HEAD-OF-WALL CONDITIONS IN ACCORDANCE WITH JOINT SYSTEM MANUFACTURER'S RECOMMENDATIONS BASED ON CONDITION ENCOUNTERED (E.G., CMU-TO-DECK (PARALLEL OR PERPENDICULAR TO FLUTES); OR CFSF-TO-DECK (PARALLEL OR PERPENDICULAR TO FLUTES) TO MAINTAIN ASSEMBLY RATING CONSISTENT WITH WALL/PARTITION REQUIREMENTS. BRACE WALL AS INDICATED OR REQUIRED.

B. AT ALL OTHER WALLS INDICATED TO EXTEND TO UNDERSIDE OF FLOOR/ROOF DECK/CAP: SEAL ALL NON-OBSTRUCTED HEAD-OF-WALL CONDITIONS IN ACCORDANCE WITH JOINT SYSTEM MANUFACTURER'S RECOMMENDATIONS BASED ON CONDITION ENCOUNTERED (E.G., CMU-TO-DECK (PARALLEL OR PERPENDICULAR TO FLUTES); OR CFSF-TO-DECK (PARALLEL OR PERPENDICULAR TO FLUTES). BRACE WALL AS INDICATED OR REQUIRED.

C. AT ALL WALLS PREVENTED FROM TERMINATING AT THE UNDERSIDE OF FLOOR/ROOF DECK BY OBSTRUCTIONS, COMPLY WITH THE FOLLOWING:

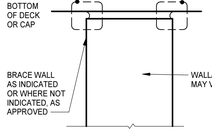
- AT FIRE-, SMOKE-, AND ACOUSTICALLY-RATED WALLS: ENCASE OBSTRUCTION(S) TO MAINTAIN ASSEMBLY RATING CONSISTENT WITH WALL/PARTITION REQUIREMENTS.
- AT SECURITY WALLS: TERMINATE IN ACCORDANCE WITH SECURITY PARTITION REQUIREMENTS.
- AT OTHER WALLS: ENCASE OBSTRUCTION(S) ON ONE SIDE.
- SEAL ENCASEMENT TO WALL AND SEAL ENCASEMENT TO DECK IN ACCORDANCE WITH JOINT SYSTEM MANUFACTURER'S RECOMMENDATIONS AND TO MAINTAIN ASSEMBLY RATING CONSISTENT WITH WALL/PARTITION REQUIREMENTS.

TERMINATIONS

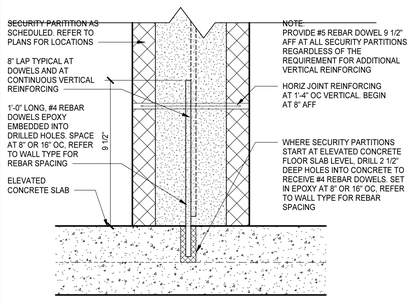


HEAD-OF-WALL TERMINATION @ OBSTRUCTION

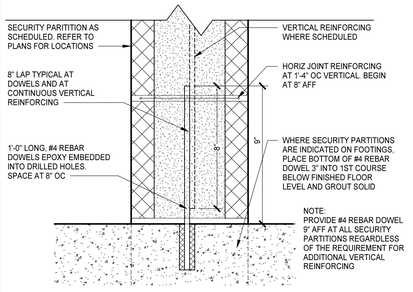
OBSTRUCTION MAY VARY (BEAM, JOIST, GIRDER, CHANNEL, DUCTWORK, PIPING)



HEAD-OF-WALL TERMINATION @ NON-OBSTRUCTION



SECURITY MASONRY WALLS ON ELEVATED CONCRETE FLOOR SLABS



SECURITY MASONRY WALLS ON CONCRETE SLAB ON GRADE

WALL JOINT GENERAL NOTES

A. LOCATE CONTROL JOINTS IN INTERIOR AND EXTERIOR WALLS AS INDICATED ON DRAWINGS.

B. JOINTS ARE INDICATED THUS ◀ ON PLANS AND ELEVATIONS.

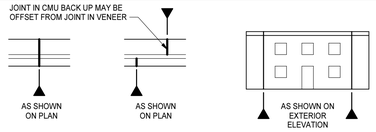
C. WALLS AND JOINT TYPES/DETAILS ARE DIAGRAMMATIC. ADJUST JOINT TYPES/DETAILS IN ACCORDANCE WITH ACTUAL FIELD CONDITIONS.

D. PROVIDE TESTED JOINT ASSEMBLIES AT FIRE-, SMOKE-, AND ACOUSTICAL-RATED WALLS.

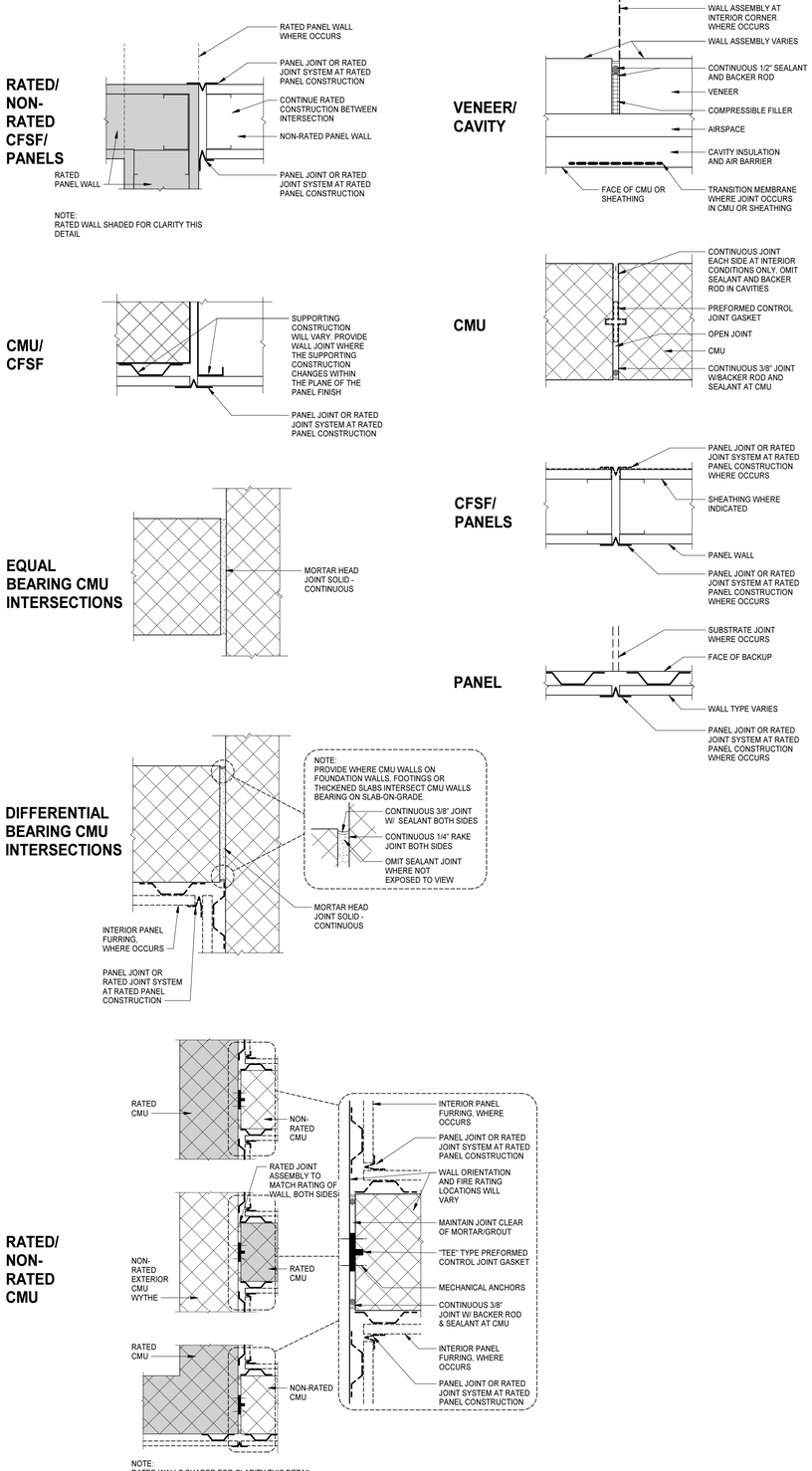
E. WHEN USED HEREIN "RATED" MEANS: FIRE, SMOKE, AND/OR ACOUSTICAL.

F. REFER TO SPECIFICATIONS FOR ADDITIONAL WALL JOINT REQUIREMENTS.

EXTERIOR WALL JOINT GRAPHICS



WALL JOINTS



WALL/PARTITION TYPE GENERAL NOTES

A. PLAN DIMENSIONS ARE TO FACE OF WALL OR PARTITION. WHERE APPLIED FINISHES OCCUR-SUCH AS CERAMIC TILE-DIMENSIONS ARE TO FACE OF APPLIED FINISH. FOR WAINSCOTS, FLOOR PLAN DIMENSIONS ARE TO FACE OF WAINSCOT MATERIAL. APPLIED FINISHES ARE NOT ALLOWED TO REDUCE CLEAR DIMENSIONS. "APPLIED FINISHES" IN THIS CASE DO NOT INCLUDE TRIM, BASE, AND ACOUSTIC WALL PANELS.

B. EXTEND WALL/PARTITION ASSEMBLY COMPONENTS FULL HEIGHT OF ASSEMBLY.

C. ALL INTERIOR MASONRY UNIT PARTITIONS: M1 UNLESS INDICATED OTHERWISE.

D. ALL INTERIOR CFSF PANEL PARTITIONS: P1 UNLESS INDICATED OTHERWISE.

E. REFER TO STRUCTURAL AND DETENTION DRAWINGS AND RELATED SPECIFICATIONS FOR SOLID MASONRY, GROUTING, AND REINFORCEMENT REQUIREMENTS INCLUDING BUT MAY NOT BE LIMITED TO:

- MASONRY WALLS/PARTITIONS
- LINTELS
- LINTEL BEARING CONDITIONS
- BOND BEAMS
- SHELF BEARING CONDITIONS
- STRUCTURAL REINFORCING REQUIREMENTS
- CHANGES IN WYTHE

F. THE TERMS "WALL" AND "PARTITION" MAY BE USED INTERCHANGEABLY THROUGHOUT THE CONTRACT DOCUMENTS.

G. EXTEND ALL FIRE-, SMOKE-, INCIDENTAL USE-, AND ACOUSTICAL-RATED WALLS/PARTITIONS TO UNDERSIDE OF FLOOR DECK, ROOF DECK, STRUCTURAL ELEMENT ENCASEMENT OR SOLID CAP ABOVE.

- SEAL AND TERMINATE IN ACCORDANCE WITH JOINT SYSTEM TESTED ASSEMBLIES FOR RESPECTIVE TYPE OF WALLS/PARTITIONS.

H. PARTITIONS THAT DO NOT EXTEND TO UNDERSIDE OF DECK OR CAP ABOVE:

- EXTEND 4 INCHES MINIMUM ABOVE HIGHEST ADJACENT FINISH CEILING UNLESS INDICATED OTHERWISE.

I. DO NOT CONNECT TIES, ANCHORS, OR REINFORCING TO SINGLE CANTILEVERED FIRE WALL OR BETWEEN DOUBLE FIRE WALLS.

J. SEAL AROUND ALL PENETRATIONS.

K. COMPLY WITH TERMINATION, WALL JOINT, AND MISCELLANEOUS DETAILS FOR THOSE CONDITIONS WHERE APPLICABLE. COMPLY WITH REFERENCED STANDARDS WHERE DETAILS ARE NOT IDENTIFIED IN THE DRAWINGS.

L. WALL/PARTITION TYPES DO NOT ADDRESS WALL FINISHES. REFER TO FINISH SCHEDULE.

M. FINISHED SPACES: PROVIDE CHASES AROUND ALL EXPOSED VERTICAL COMPONENTS, INCLUDING BUT NOT LIMITED TO: DUCTWORK, PIPING, AND CONDUIT, UNLESS COMPONENTS ARE SPECIFICALLY INDICATED TO REMAIN EXPOSED. IF NOT OTHERWISE INDICATED, PROVIDE P2 CHASE CONSTRUCTION.

- HOLD CHASES TIGHT TO COMPONENTS ALLOWING FOR ACCESS, INSULATION, AND TOLERANCES.
- EXTEND CHASES FROM FLOOR TO 4 INCHES MINIMUM ABOVE FINISH CEILING OR IF NO CEILING IS INDICATED, EXTEND CHASES TO UNDERSIDE OF FLOOR DECK, ROOF DECK, OR SOLID CAP ABOVE AND TERMINATE ACCORDINGLY.

N. PROVIDE BACKER BOARD/UNIT OF SAME THICKNESS INDICATED IN LIEU OF GYPSUM BOARD PANEL AT PORTIONS OF WALLS/PARTITIONS TO RECEIVE TILE.

O. PROVIDE P5 FURRING ON INTERIOR SIDES OF ALL EXISTING WALLS, UNLESS INDICATED OTHERWISE.

MASONRY UNIT WALL/PARTITION TYPES

REPRESENTED BY Xnn

MARK	FIRE RATED ASSEMBLY (REFER TO G1.4.1 FOR LEGEND)	REMARKS	INFORMATION
M1	--	REFER TO STRUCTURAL FOR SHEAR WALL LOCATIONS	7 5/8" — 8" CMU
M2	--	--	5 5/8" — 6" CMU

PANEL WALL/PARTITION TYPES

REPRESENTED BY Xnn

MARK	FIRE RATED ASSEMBLY (REFER TO G1.4.1 FOR LEGEND)	REMARKS	INFORMATION
P1	--	--	4 7/8" — 5/8" GYP BD; 3 5/8" CFSF-NS; 3" SOUND ATTENUATION BATTS
P2	--		4 1/4" — 5/8" GYP BD; 3 5/8" CFSF-NS; 3" SOUND ATTENUATION BATTS
P3	--	--	7 1/4" — 5/8" GYP BD; 6" CFSF-NS; 6" SOUND ATTENUATION BATTS
P4	--		6 5/8" — 5/8" GYP BD; 6" CFSF-NS; 6" SOUND ATTENUATION BATTS
P5	--	--	1 1/2" — 5/8" GYP BD; 7/8" CFSF-NS FURRING
P6	--	--	3 1/8" — 5/8" GYP BD; 2 1/2" CFSF-NS
P7	--	STC-60	5 1/2" — 2 LAYERS 5/8" GYP BD; 5/8" GYP BD; 3 5/8" CFSF-NS; 3" SOUND ATTENUATION BATTS
P8	--	STC-60	7 7/8" — 2 LAYERS 5/8" GYP BD; 5/8" GYP BD; 6" CFSF-NS; 6" SOUND ATTENUATION BATTS

SECURITY WALL/PARTITION TYPES

REPRESENTED BY Xnn

MARK	FIRE RATED ASSEMBLY (REFER TO G1.4.1 FOR LEGEND)	REMARKS	INFORMATION
S1	--	--	7 5/8" — 8" CMU, FULLY GROUTED
S2	--	--	4 7/8" — 5/8" IMPACT RESISTANT GYP BD; EXPANDED METAL MESH (ON UNSECURE SIDE); 3 5/8" CFSF-S; SOUND BATT INSULATION
S3	--	--	7 1/4" — 5/8" IMPACT RESISTANT GYP BD; EXPANDED METAL MESH (ON UNSECURE SIDE); 3 5/8" CFSF-S; SOUND BATT INSULATION
S4	--	STC-60	5 1/2" — 5/8" IMPACT RESISTANT GYP BD; 5/8" GYP BD; EXPANDED METAL MESH (ON UNSECURE SIDE); 3 5/8" CFSF-S; SOUND BATT INSULATION
S5	--	STC-60	7 7/8" — 5/8" IMPACT RESISTANT GYP BD; 5/8" GYP BD; EXPANDED METAL MESH (ON UNSECURE SIDE); 3 5/8" CFSF-S; SOUND BATT INSULATION

Moseley
3200 NORFOLK STREET. RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026

SUBMITTAL: BID SET

REVISIONS

DATE	DESCRIPTION

ASSEMBLIES

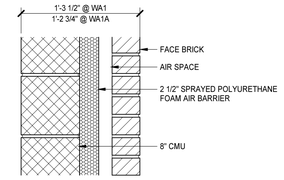
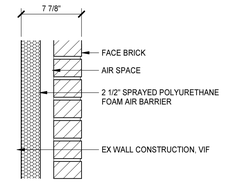
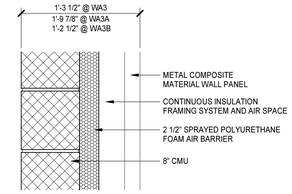
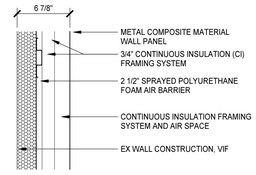
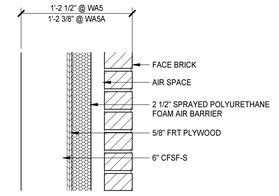
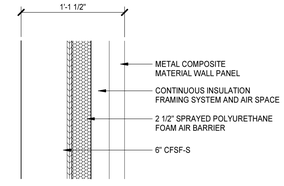
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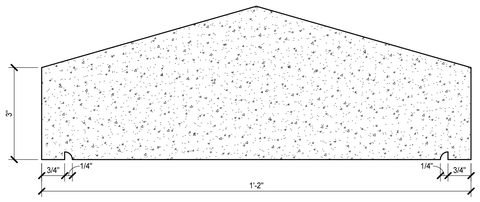
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EXTERIOR WALL ASSEMBLIES

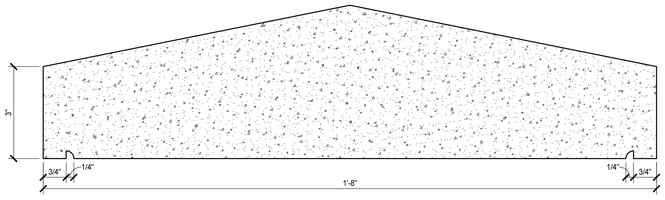
APPLIES TO A3.1.1 AND A3.2.1 SERIES OF DRAWINGS

REPRESENTED BY ⟨WAn⟩

MARK	FIRE RATING (REFER TO G1.4.1 FOR LEGEND)	REMARKS	INFORMATION
WA1 **WA1A**			
WA2			
WA3 **WA3A** **WA3B**			
WA4			
WA5 **WA5A**			
WA6			



CAST STONE SHAPE 2



CAST STONE SHAPE 1

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

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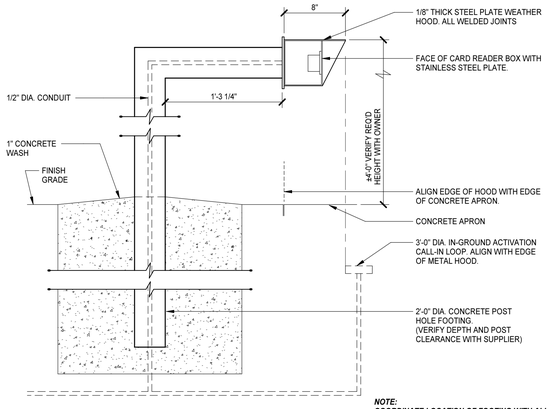
REVISIONS

DATE	DESCRIPTION

ASSEMBLIES

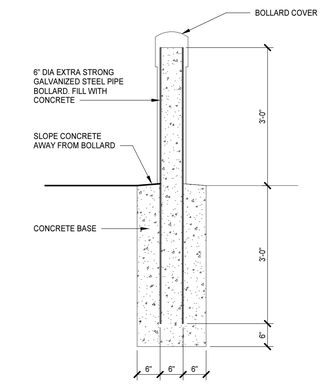
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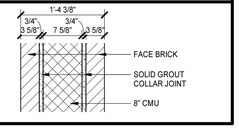
NOTE:
COORDINATE LOCATION OF FOOTING WITH ALL UNDERGROUND UTILITIES AND COMMUNICATIONS, GRADE BEAMS, FOOTINGS AND OTHER BELOW GRADE CONSTRUCTION.

3 TYP A0.2.1 **DRIVE-UP INTERCOM**
1 1/2" = 1'-0"



2 TYP A0.2.1 **PIPE BOLLARD DETAIL**
3/4" = 1'-0"

SITE WALL TYPES
REPRESENTED BY SW.n

MARK	FIRE RATED ASSEMBLY (REFER TO G1.1.1 FOR LEGEND)	REMARKS	INFORMATION
SW1	-	SOLID GROUT CMU BELOW GRADE	

ARCHITECTURAL SITE PLAN KEYNOTES
REPRESENTED BY n
APPLIES TO DRAWINGS A0.2.1 - A0.2.X

15	TRACKLESS BI-FOLDING GATE, 2 PANEL
16	1/2" EXP JOINT W/ COMPRESSIBLE FILLER
17	THROUGH WALL WEEPS AT 4'-0" OC HORIZONTALLY
18	STAFF PATIO
19	BOLLARD
20	EX BUILDING
21	ELECTRICAL CONTROLLER
22	CANOPY ABOVE, REFER TO A1.3.1
23	EXTRUDED ALUMINUM SAFETY TREAD. 1/2" NOSING RADIUS MAXIMUM. REFER TO SPEC 055000
24	CONCRETE FOOTING, REFER TO STRUCTURAL

ARCHITECTURAL SITE PLAN GENERAL NOTES

A. PROVIDE 2" MAX GAP BETWEEN SECURITY GATE AND SECURITY FENCE

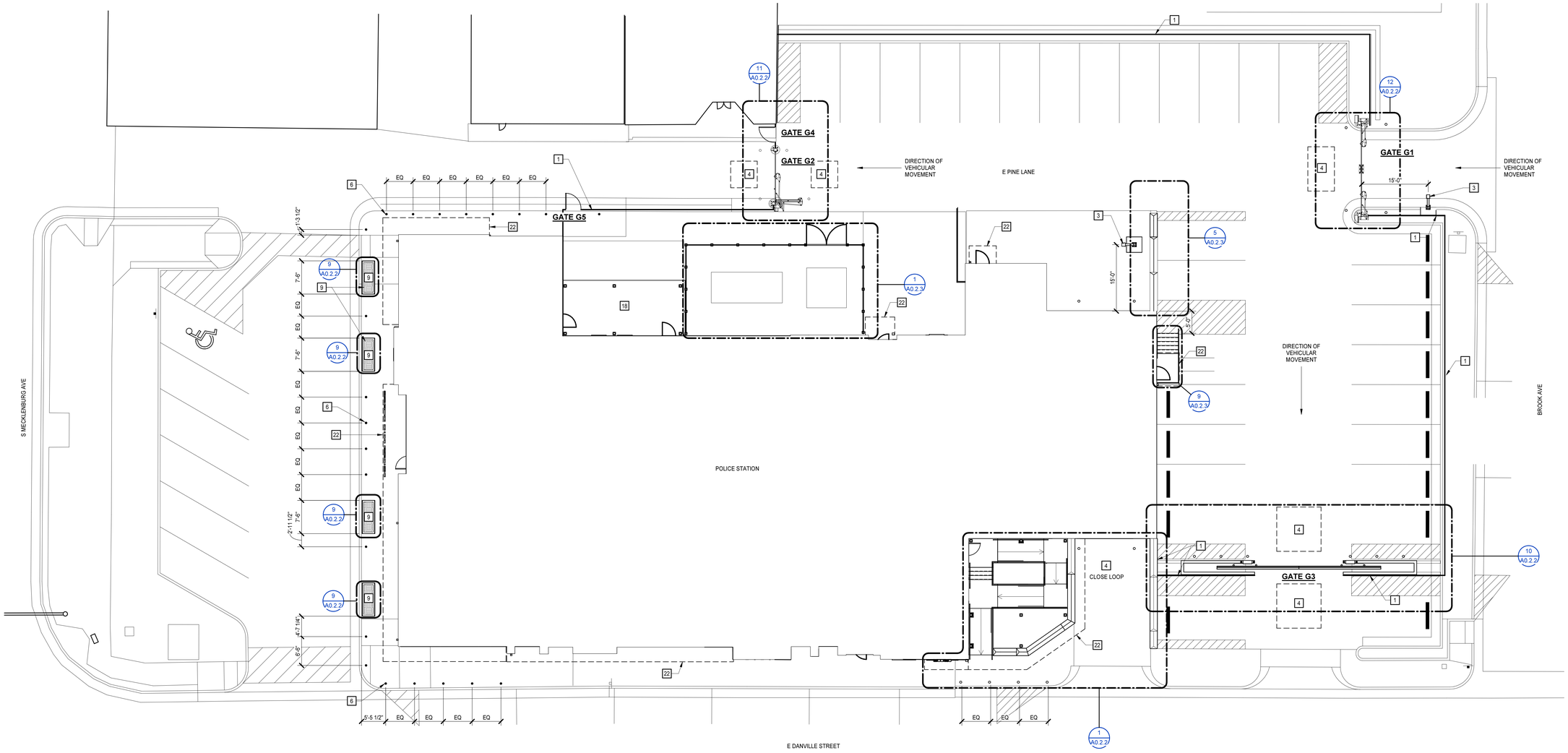
B. PROVIDE 2" MAX GAP BETWEEN SECURITY FENCE AND EXISTING BUILDING

ARCHITECTURAL SITE PLAN KEYNOTES
REPRESENTED BY n
APPLIES TO DRAWINGS A0.2.1 - A0.2.X

1	8'-0" TALL SECURITY FENCE. BASIS-OF-DESIGN: WIREWORKS ANTI-CLIMB WELDED WIRE FENCE
2	HEAVY DUTY CANTILEVER SLIDING GATE
3	DRIVE-UP INTERCOM STANCHION - REFER TO 3/A0.2.1
4	UNDERGROUND VEHICLE DETECTOR LOOP
5	REFER TO CIVIL DRAWINGS FOR FINISH GRADE
6	BOLLARD - REFER TO DETAIL 2/A0.2.1
7	CONTINUOUS METAL FLASHING WITH DRIP EDGE BOTH SIDES
8	CAST STONE COPING, SHAPE 1
9	CORTEN STEEL PLANTER
10	GRAVEL
11	4" SQUARE GALV STEEL GATE POST WITH PVC COATING. PROVIDE SPACING AND FOOTINGS BASED ON MANUFACTURER SELECTION
12	POST MOUNTED GATE OPERATOR. CONFIRM POST SPACING WITH MANUFACTURER.
13	CONCRETE TROUGH. VERIFY DIMENSIONS OF TROUGH WITH REQUIREMENTS OF GATE MANUFACTURER.
14	TRACKLESS BI-FOLDING GATE, 4 PANEL

GATE SCHEDULE

GATE #	GATE TYPE	MATERIAL	GATE SIZE	LOCATION	HARDWARE SET	NOTES
G1	TRACKLESS BI-FOLDING GATE, 4 PANEL	WIRE MESH GALVANIZED STEEL		SECURE PARKING ENTRANCE		
G2	TRACKLESS BI-FOLDING GATE, 2 PANEL	WIRE MESH GALVANIZED STEEL		SECURE PARKING WEST EXIT		
G3	HEAVY DUTY CANTILEVER SLIDING GATE	WIRE MESH GALVANIZED STEEL		SECURE PARKING SOUTH EXIT		
G4	SINGLE SWING GATE	WIRE MESH GALVANIZED STEEL	3'-6"W X 8'-0"H	PEDESTRIAN ACCESS TO E PINE LANE		PIN CODE ACCESS
G5	SINGLE SWING GATE	WIRE MESH GALVANIZED STEEL	3'-6"W X 8'-0"H	PEDESTRIAN ACCESS TO STAFF PATIO		PIN CODE ACCESS



1 A0.2.2 A0.2.1 **ARCHITECTURAL SITE PLAN**
1" = 10'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

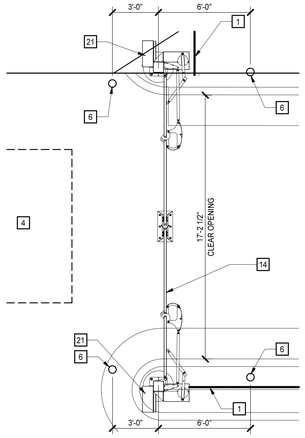
PROJECT NO: 651033	DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET	

REVISIONS	
DATE	DESCRIPTION

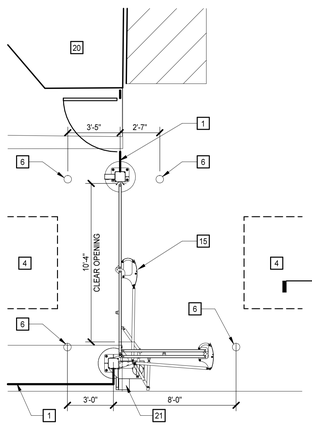
ARCHITECTURAL SITE PLAN

A0.2.1

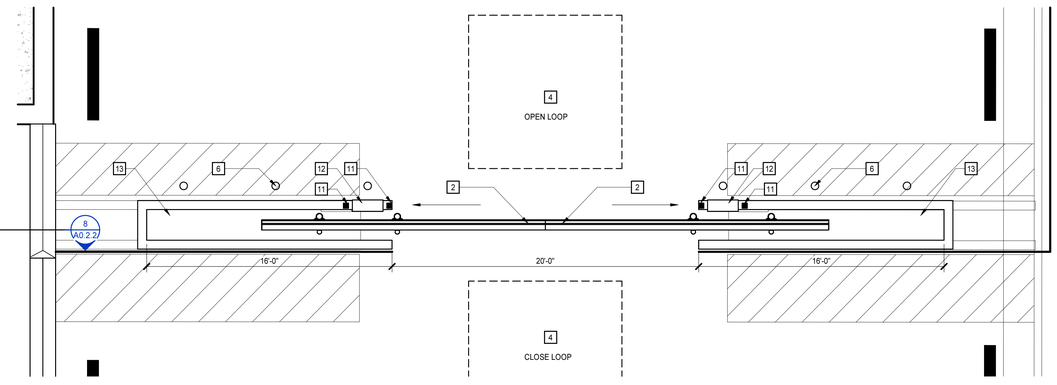
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12 ENLARGED SITE PLAN - GATE G1
A0.2.1 | A0.2.2 — 1/4" = 1'-0"



11 ENLARGED SITE PLAN - GATE G2
A0.2.1 | A0.2.2 — 1/4" = 1'-0"

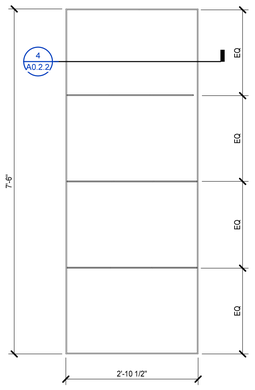


10 ENLARGED SITE PLAN - GATE G3
A0.2.1 | A0.2.2 — 1/4" = 1'-0"

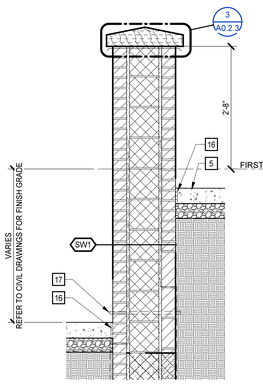
ARCHITECTURAL SITE PLAN KEYNOTES
REPRESENTED BY n

APPLIES TO DRAWINGS A0.2.1 - A0.2.X

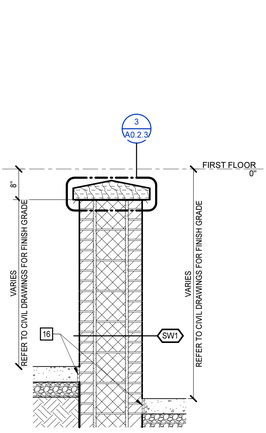
1	8'-0" TALL SECURITY FENCE. BASIS-OF-DESIGN: WIREWORKS ANTI-CLIMB WELDED WIRE FENCE
2	HEAVY DUTY CANTILEVER SLIDING GATE
3	DRIVE-UP INTERCOM STANCHION - REFER TO 3/A0.2.1
4	UNDERGROUND VEHICLE DETECTOR LOOP
5	REFER TO CIVIL DRAWINGS FOR FINISH GRADE
6	BOLLARD - REFER TO DETAIL 2/A0.2.1
7	CONTINUOUS METAL FLASHING WITH DRIP EDGE BOTH SIDES
8	CAST STONE COPING, SHAPE 1
9	CORTEN STEEL PLANTER
10	GRAVEL
11	4" SQUARE GALV STEEL GATE POST WITH PVC COATING. PROVIDE SPACING AND FOOTINGS BASED ON MANUFACTURER SELECTION
12	POST MOUNTED GATE OPERATOR. CONFIRM POST SPACING WITH MANUFACTURER.
13	CONCRETE TROUGH. VERIFY DIMENSIONS OF TROUGH WITH REQUIREMENTS OF GATE MANUFACTURER.
14	TRACKLESS BI-FOLDING GATE, 4 PANEL
15	TRACKLESS BI-FOLDING GATE, 2 PANEL
16	1/2" EXP JOINT W/ COMPRESSIBLE FILLER
17	THROUGH WALL WEEPS AT 4'-0" OC HORIZONTALLY
18	STAFF PATIO
19	BOLLARD
20	EX BUILDING
21	ELECTRICAL CONTROLLER
22	CANOPY ABOVE, REFER TO A1.3.1
23	EXTRUDED ALUMINUM SAFETY TREAD. 1/2" NOSING RADIUS MAXIMUM. REFER TO SPEC 055000
24	CONCRETE FOOTING, REFER TO STRUCTURAL



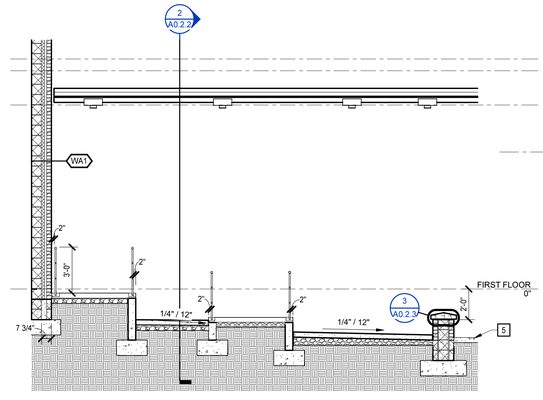
9 PLANTER BOX PLAN
A0.2.1 | A0.2.2 — 3/4" = 1'-0"



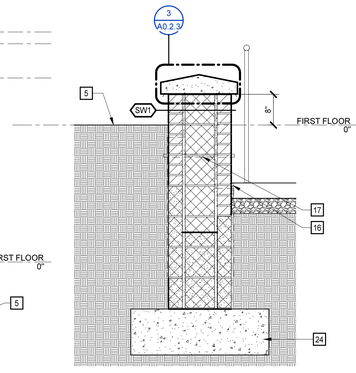
8 SITE WALL SECTION
A0.2.2 | A0.2.2 — 3/4" = 1'-0"



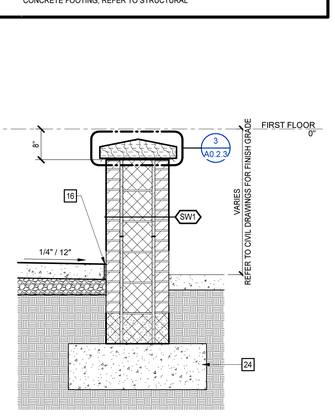
13 SITE WALL SECTION
A0.2.2 | A0.2.2 — 3/4" = 1'-0"



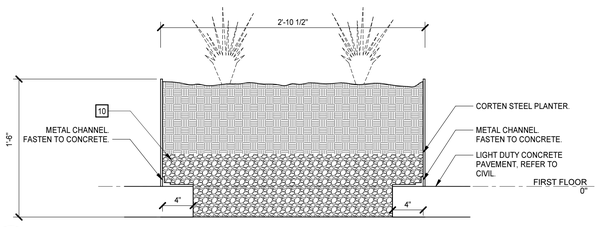
7 SITE RAMP SECTION
A0.2.2 | A0.2.2 — 1/4" = 1'-0"



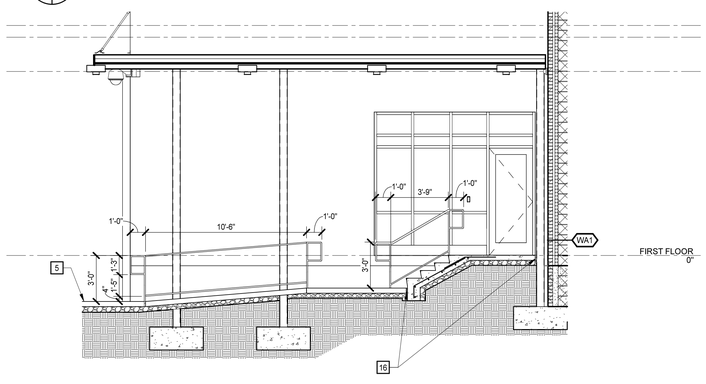
6 SITE WALL SECTION
A0.2.2 | A0.2.2 — 3/4" = 1'-0"



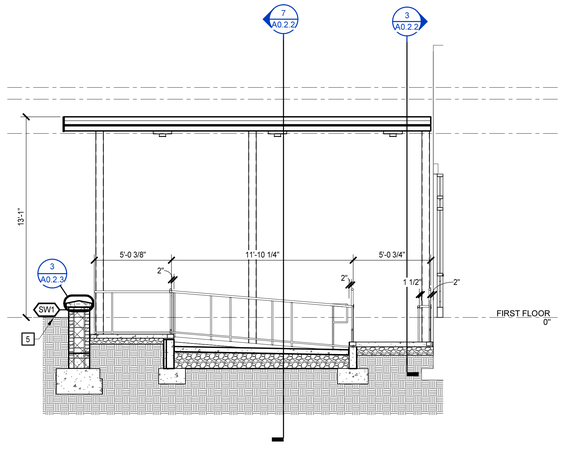
5 SITE WALL SECTION
A0.2.2 | A0.2.2 — 3/4" = 1'-0"



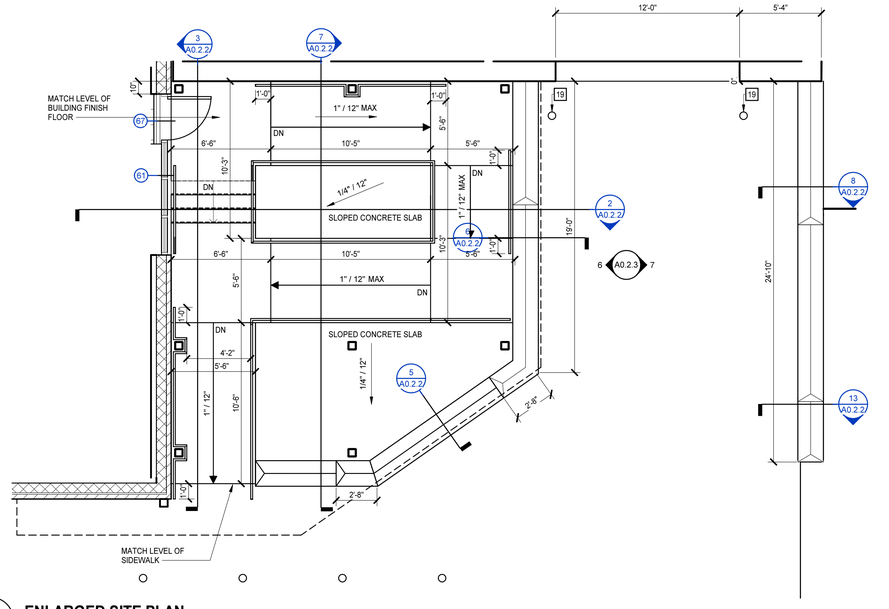
4 PLANTER BOX SECTION
A0.2.2 | A0.2.2 — 1 1/2" = 1'-0"



3 SITE RAMP SECTION
A0.2.2 | A0.2.2 — 1/4" = 1'-0"



2 SITE RAMP SECTION
A0.2.2 | A0.2.2 — 1/4" = 1'-0"



1 ENLARGED SITE PLAN
A0.2.1 | A0.2.2 — 1/4" = 1'-0"

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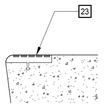
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DATE DESCRIPTION

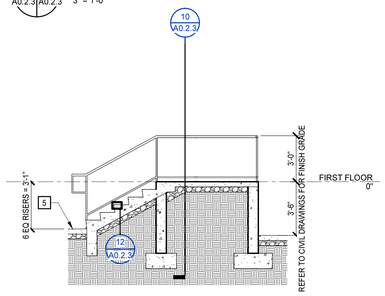
ARCHITECTURAL SITE PLAN DETAILS

A0.2.2

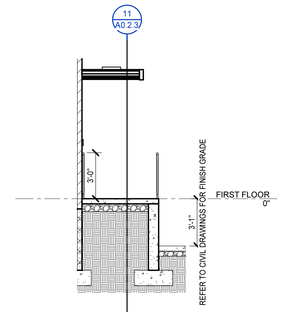
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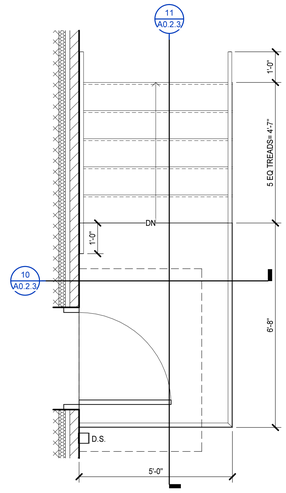
12 EXTERIOR STAIR NOSING
A0.2.3 | A0.2.3 — 3" = 1'-0"



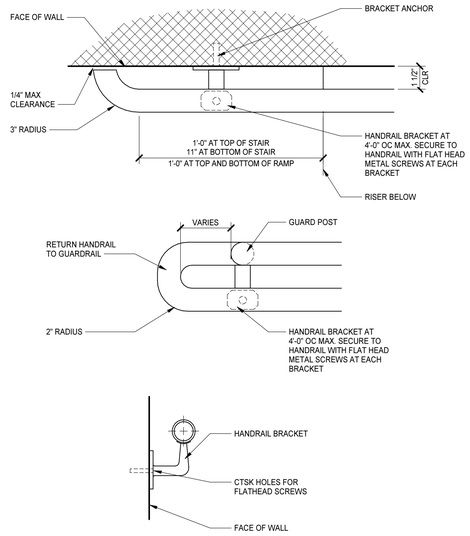
11 SECTION
A0.2.3 | A0.2.3 — 1/4" = 1'-0"



10 SECTION
A0.2.3 | A0.2.3 — 1/4" = 1'-0"



9 ENLARGED PLAN
A0.2.1 | A0.2.3 — 1/2" = 1'-0"



HANDRAIL DETAILS

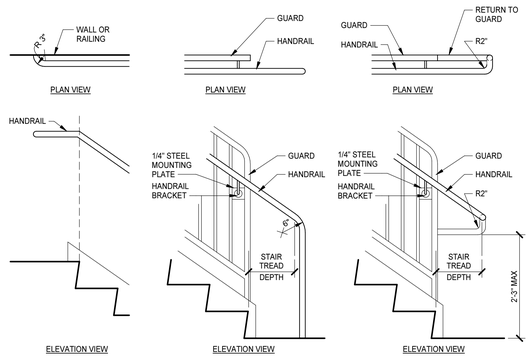
GENERAL NOTES

A. ALL RAILING INFILL PANELS: 3/4" X 3/4" STL BARS, UNO

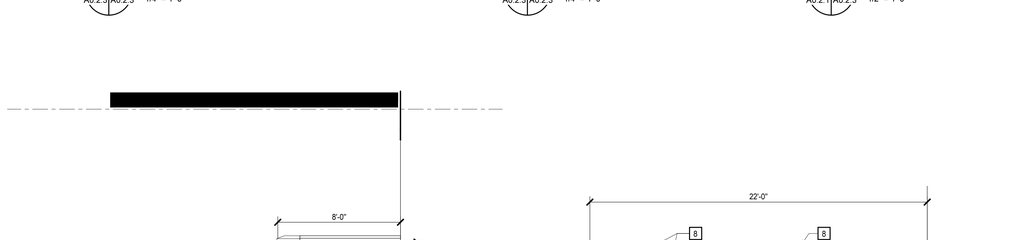
B. TOP OF HANDRAIL: 3'-0" ABOVE EDGE OF RISERS AND FINISH FLOOR

C. TOP OF GUARDS: 3'-7" ABOVE EDGE OF RISERS AND FINISH FLOOR

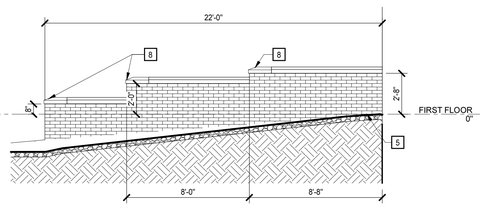
D. ALL RAILING: 1 1/4" STL PIPE, UNO



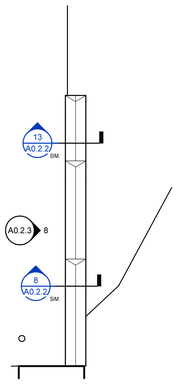
HANDRAIL PLANS AND ELEVS.



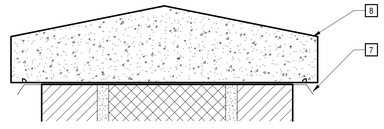
6 SITE WALL ELEVATION
A0.2.2 | A0.2.3 — 1/4" = 1'-0"



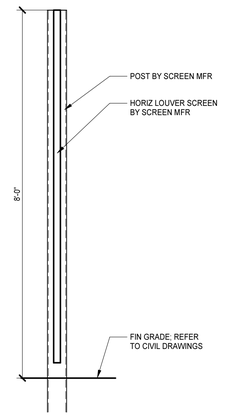
8 SITE WALL ELEVATION
A0.2.3 | A0.2.3 — 1/4" = 1'-0"



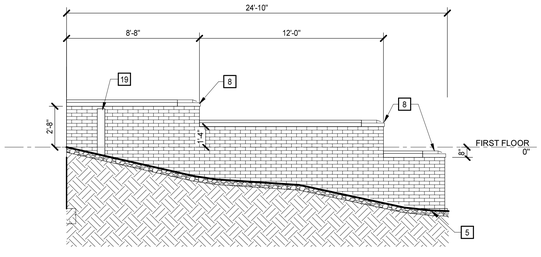
5 ENLARGED SITE PLAN
A0.2.1 | A0.2.3 — 1 : 60



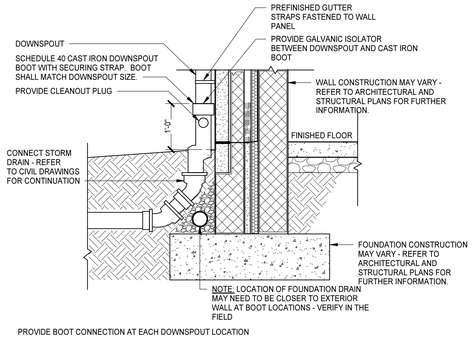
3 DETAIL
A0.2.2 | A0.2.3 — 3" = 1'-0"



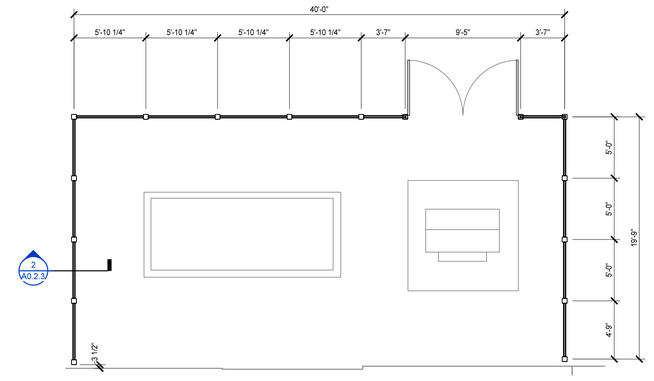
2 WALL SECTION
A0.2.3 | A0.2.3 — 3/4" = 1'-0"



7 SITE WALL ELEVATION
A0.2.2 | A0.2.3 — 1/4" = 1'-0"



4 DOWNSPOUT BOOT CONNECTION DETAIL
A0.2.3 — 3/4" = 1'-0"



1 ENLARGED SITE PLAN - MECHANICAL ENCLOSURE
A0.2.1 | A0.2.3 — 1 : 60

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3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
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PROJECT NO: 651033 DATE: OCTOBER 21, 2026
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DATE DESCRIPTION

ARCHITECTURAL SITE PLAN DETAILS

A0.2.3

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DEMOLITION PLAN GENERAL NOTES

A. EXISTING INFORMATION WAS DETERMINED FROM DRAWINGS, DATED 1988 AND NON-DESTRUCTIVE OBSERVATIONS.

B. REMOVE EXISTING CONSTRUCTION INDICATED DASHED. REFER TO DEMOLITION KEYNOTES FOR ADDITIONAL INFORMATION.

C. REPRESENTATION OF EXISTING ITEMS ARE TO BE CONSIDERED GENERAL IN NATURE, AND ARE BASED UPON INFORMATION PROVIDED BY THE OWNER'S RECORD DRAWINGS, AND BY NON-DESTRUCTIVE FIELD OBSERVATIONS. DEMOLITION WORK IS NOT COMPREHENSIVE IN ALL DETAILS OF EXISTING CONDITIONS THAT SHALL BE REMOVED TO COMPLETE TO THE WORK OF THE CONTRACT.

D. NOTIFY THE ARCHITECT OF ANY EXISTING CONDITIONS THAT PREVENT THE EXECUTION OF THE WORK INDICATED.

E. REFER TO OTHER DISCIPLINE DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DEMOLITION WORK REQUIRED. ALL DEMOLITION WORK IS NOT INDICATED ON THE ARCHITECTURAL DRAWINGS.

F. SALVAGE ALL BRICK INDICATED TO BE REMOVED.

G. REMOVE FLOOR FINISHES, WALL BASE, CHAIR RAILS, CEILINGS AND MOLDINGS THROUGHOUT WORK AREA, UNO.

H. REMOVE ALL INTERIOR FURRING.

I. DIMENSIONS INDICATED ON DEMOLITION PLANS ARE APPROXIMATE. VERIFY ACTUAL EXISTING CONDITIONS IN FIELD.

J. WALL CONSTRUCTION AND THICKNESS INDICATED ON DEMOLITION PLANS ARE APPROXIMATE. VERIFY ACTUAL CONSTRUCTION TYPES AND MATERIAL CONDITIONS IN FIELD.

K. ALL STRUCTURAL MEMBERS ARE TO REMAIN.

J. REMOVE DUCTS AT MECHANICAL FLOOR PENETRATIONS.

DEMOLITION PLAN LEGEND

APPLIES TO A0.3.X DRAWING SERIES

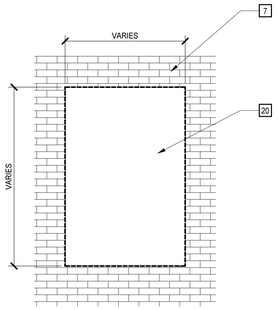
- EXISTING PARTITION/ WALL/ ITEM TO REMAIN
- REMOVE EXISTING PARTITION/WALL/ITEM
- REMOVE EXISTING WINDOW ASSEMBLY AND FRAMING, INCLUDING ANCHORS
- REMOVE EXISTING DOOR AND FRAME ASSEMBLY INCLUDING DOOR HARDWARE, ANCHORS, AND THRESHOLD (WHERE OCCURS).
- REMOVE EXISTING PLUMBING FIXTURE. REFER TO PLUMBING DEMOLITION PLAN FOR ADDITIONAL INFORMATION.
- REMOVE ALL EXISTING FINISH FLOORING AND SUSPENDED CEILINGS IN AREA
- REMOVE EXISTING ROOF ASSEMBLY, ROOF DECK, PARAPET FLASHING AND COPING. STRUCTURE TO REMAIN
- EXTENTS OF 4" CONCRETE DECK AND METAL LATHE TO BE SAWCUT AND REMOVED. FLOOR JOISTS SHALL REMAIN UNO PER STRUCTURAL
- REMOVE SLAB AS REQUIRED. REFER TO S1.0.1 FOR INFORMATION

DEMOLITION PLAN KEYNOTES

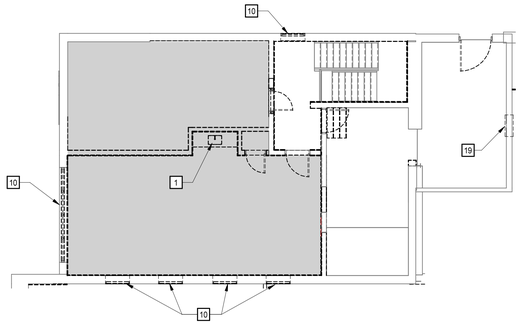
REPRESENTED BY n

APPLIES TO DRAWINGS A0.3.1 - A0.3.X

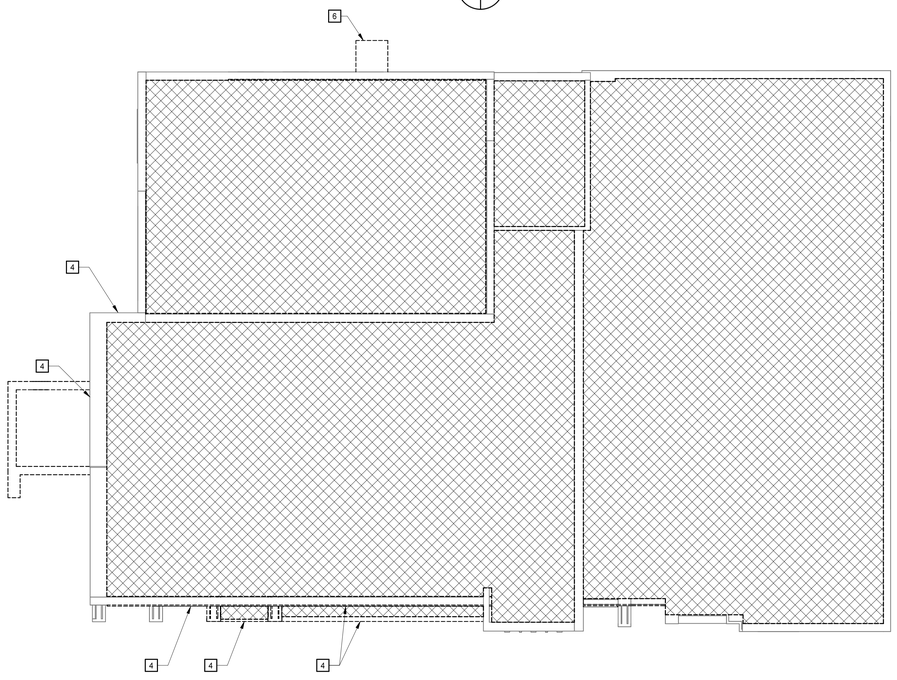
1	REMOVE PLUMBING FIXTURE
2	CONFIRM OWNER HAS AQUIRED HIGH RESOLUTION PHOTOS OF MURALS PRIOR TO DEMOLITION
3	REMOVE BANK VAULT DOOR AND ASSOCIATED FRAME AND HARDWARE
4	REMOVE EIFS
5	REMOVE EIFS AND STUD WALL
6	REMOVE CANOPY
7	REMOVE AND SALVAGE BRICK AROUND OPENING, TO BE REINSTALLED. SEE A2.1.1 FOR ADDITIONAL INFORMATION
8	REMOVE ELECTRIC WATER COOLER
9	REMOVE SLAB AND FOUNDATIONS
10	REMOVE CONC SURROUND AT WINDOW OPENING
11	REMOVE ACCORDION PARTITION
12	SEAL DOOR PERMANENTLY CLOSED
13	REMOVE SAFE DOOR AND ASSOCIATED FRAME AND HARDWARE
14	REMOVE HANDRAIL
15	REMOVE GWB ACCENT CEILING
16	REMOVE AND SALVAGE CHANDELIER FOR OWNER'S REUSE ELSEWHERE
17	REMOVE DUCT
18	REMOVE EXISTING SAFETY DEPOSIT VAULT
19	REMOVE ROOF ACCESS HATCH
20	REMOVE EX WALL FOR NEW MASONRY OPENING. SALVAGE BRICK FOR REINSTALLATION. SEE A1.1.1 AND A2.1.1 FOR MORE INFORMATION. COORDINATE DIMENSIONS WITH EX COURSING
21	REMOVE SLAB AS NEEDED FOR THRESHOLD DETAIL, SEE 51/A6.2.3



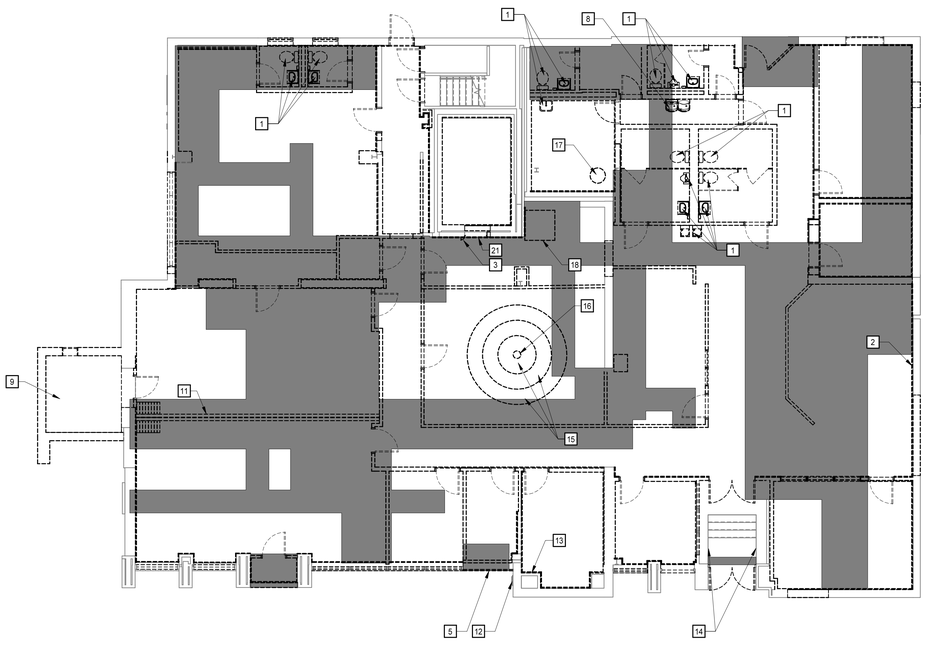
4 TYP A0.3.1 **DEMOLITION ELEVATION AT NEW MASONRY OPENING**
1/2" = 1'-0"



2 A0.2.2 A0.3.1 **DEMOLITION SECOND FLOOR PLAN**
1/8" = 1'-0"



3 A0.3.1 **DEMOLITION ROOF PLAN**
1/8" = 1'-0"



1 A0.2.2 A0.3.1 **DEMOLITION FIRST FLOOR PLAN**
1/8" = 1'-0"

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DIGITAL SIGNATURE LOCATION:

N

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DEMOLITION PLANS

A0.3.1

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FLOOR PLAN GENERAL NOTES

A. REFER TO A1.1.3 FOR APPROXIMATE FLOOR LEVELS.

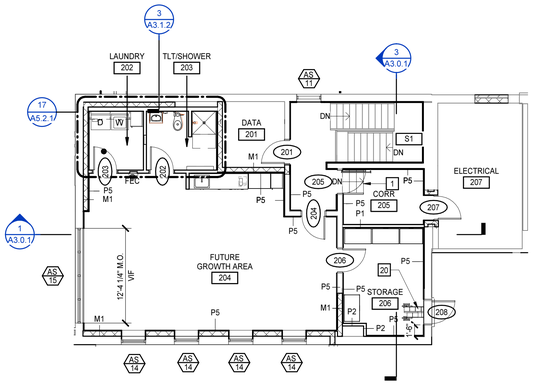
B. INFILL SLAB OPENINGS AT REMOVED MECHANICAL DUCTS.

FLOOR PLAN KEYNOTES

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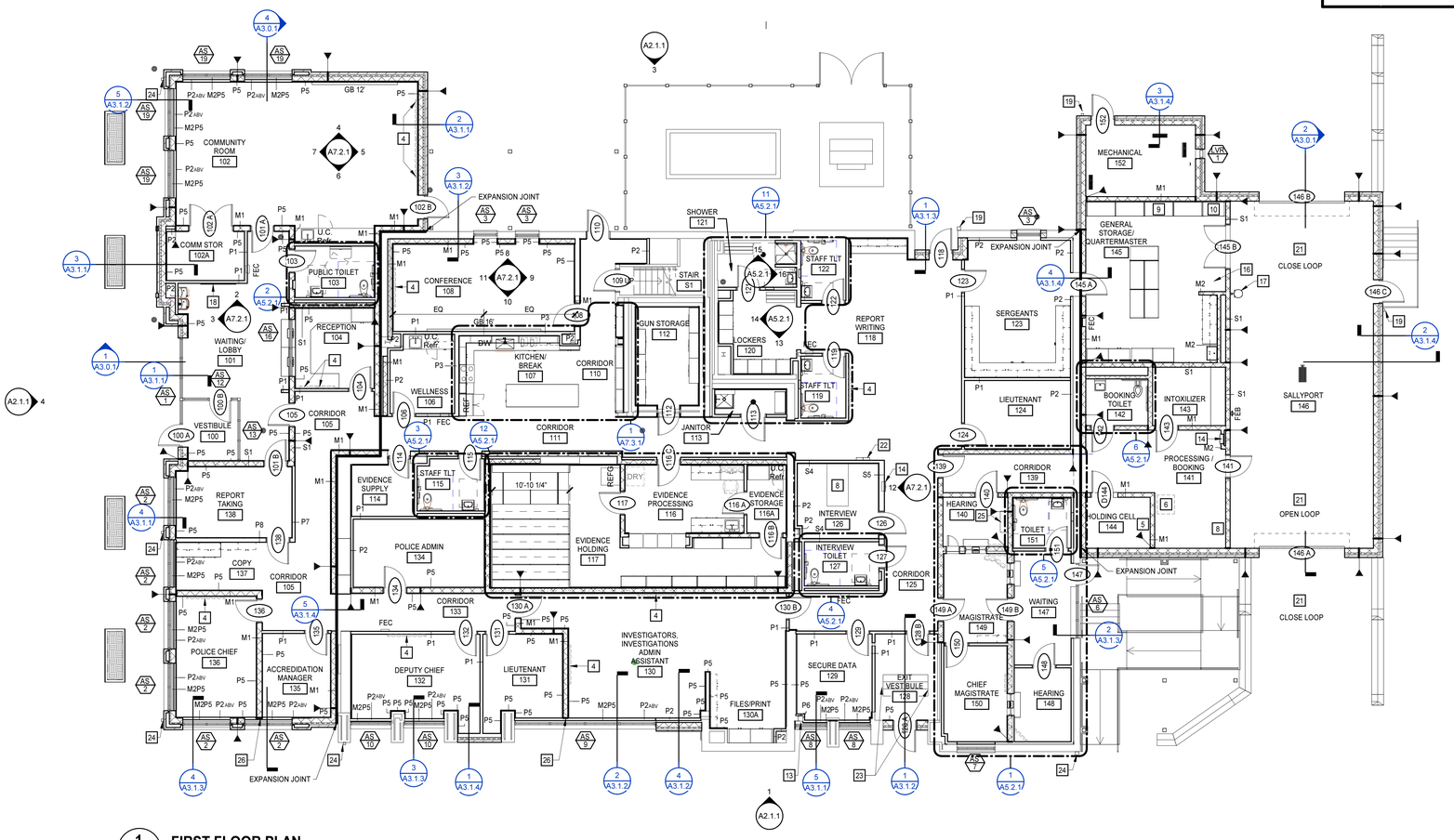
APPLIES TO DRAWINGS A1.1.1 - A1.1.X

1	3'-6" WIDE METAL STAIR WITH RAILING
2	PRE-ENGINEERED PROTECTIVE COVER
3	METAL ROOF ACCESS LADDER
4	MONITOR, NIC
5	CONCRETE DETENTION BENCH
6	LIVE SCAN MACHINE, NIC
7	STAINLESS STEEL DETENTION DESK
8	STAINLESS STEEL DETENTION TABLE
9	48"W METAL SHELVING, TYPICAL OF 10
10	36"W METAL SHELVING, TYPICAL OF 4
11	PASS-THRU EVIDENCE LOCKERS
12	HIGH DENSITY EVIDENCE STORAGE
13	EXTEND GYP SILL TO EXISTING WALL
14	GUN LOCKERS
16	GUN CLEARING TRAP
17	EYE WASH
18	ALUMINUM SIGNAGE ON STANDOFFS
19	ALUMINUM DOWNSPOUT, REFER TO A1.3.1
20	ALTERNATING TREAD STAIR
21	UNDERGROUND VEHICLE DETECTOR LOOP
22	KEY MANAGEMENT SYSTEM; BOD: KEYCAFE
23	EXISTING HANDRAIL TO REMAIN
24	ALUMINUM DOWNSPOUT TO UNDERGROUND BOOT WITH INGROUND CLEANOUT, REFER TO A1.3.1
25	BENCH, BOLTED TO FLOOR
26	EXTRUDED ALUMINUM PARTITION GAP CLOSURE ABOVE PARTITION P2



2 A0.2.2 A1.1.1 **SECOND FLOOR PLAN**

1/8" = 1'-0"



1 A0.2.2 A1.1.1 **FIRST FLOOR PLAN**

1/8" = 1'-0"

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Lic. No. 0401015628
10/21/2026
ARCHITECT

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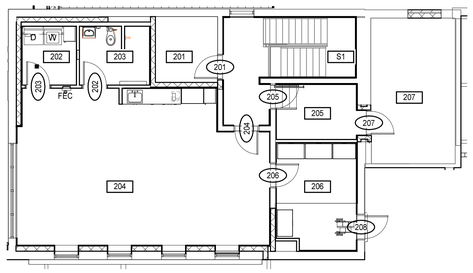
REVISIONS

DATE	DESCRIPTION

FLOOR PLANS

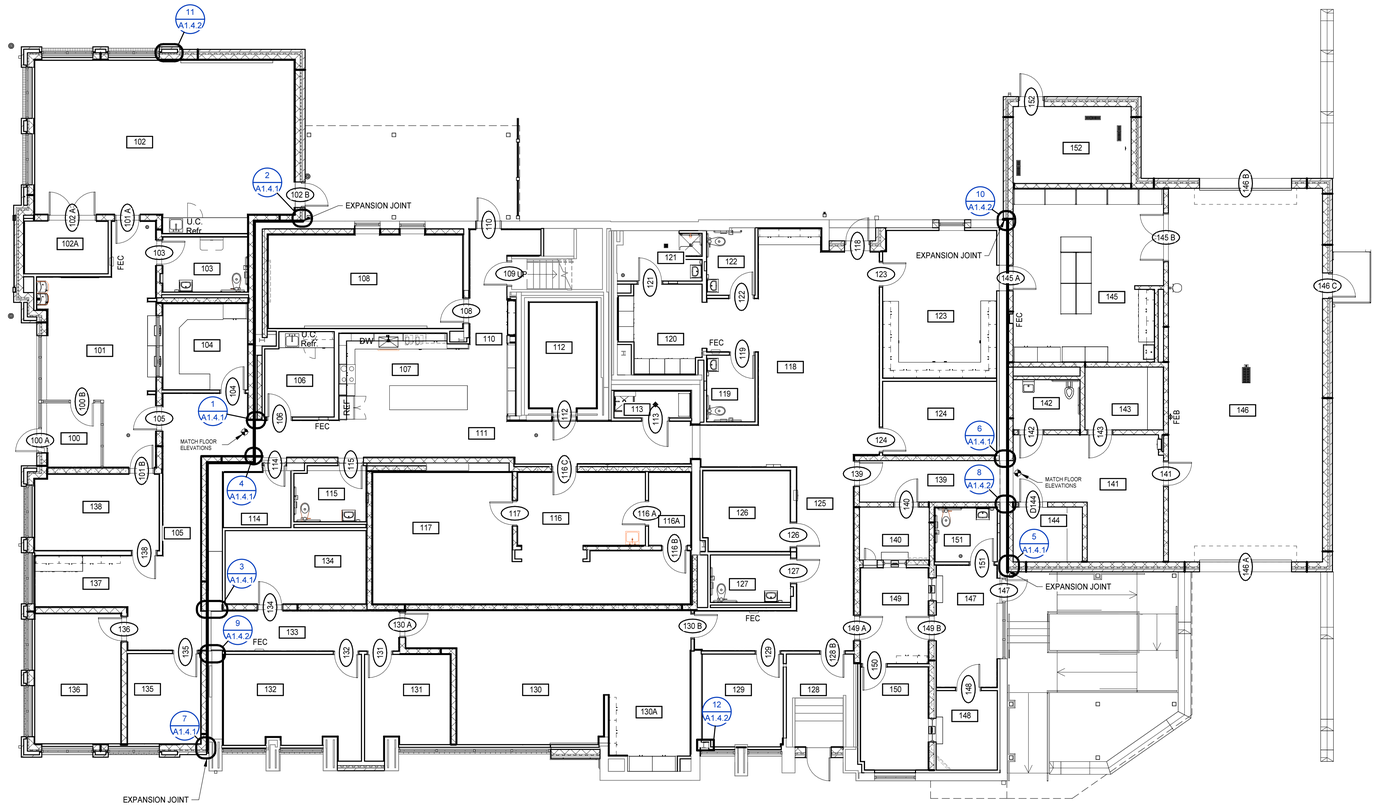
A1.1.1

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2 A0.2.2 A1.1.2 **ENLARGED PLAN DETAIL LOCATIONS - FLOOR TWO**

1/8" = 1'-0"



1 A0.2.2 A1.1.2 **ENLARGED PLAN DETAIL LOCATIONS - FLOOR ONE**

1/8" = 1'-0"

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FLOOR PLAN DETAIL LOCATIONS

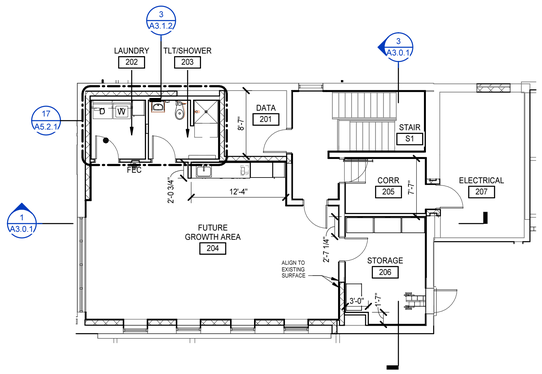
A1.1.2

DIMENSION FLOOR PLAN GENERAL NOTES

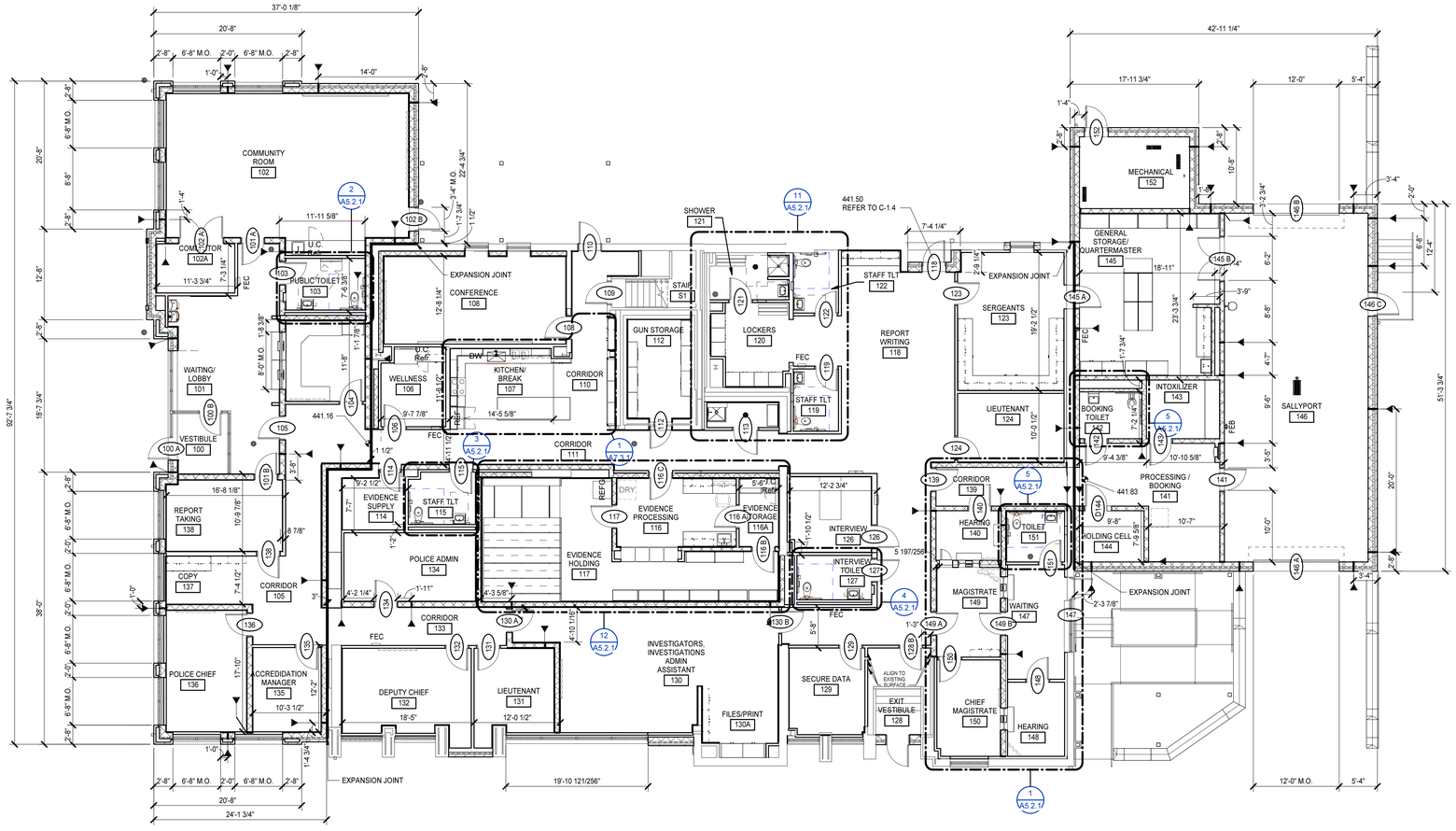
A. FLOOR LEVELS ARE APPROXIMATE AND BASED OFF OF TRUESCAN REVIT MODEL DATED 6/13/2026 AND CIVIL SITE PLAN SPOT ELEVATIONS AT EXISTING DOORS ON PLAN NORTH SIDE OF BUILDING. VERIFY FLOOR LEVELS IN FIELD. FLOOR LEVELS AT ADDITIONS ARE INTENDED TO MATCH EXISTING BUILDING AT LOCATIONS INDICATED.

DIMENSION FLOOR PLAN LEGEND BOX

XXX.XX — APPROXIMATE FINISH GRADE ELEVATION, VIF



2 SECOND FLOOR PLAN - DIMENSION PLAN
A0.2.2 A1.1.3 — 1/8" = 1'-0"



1 FIRST FLOOR PLAN - DIMENSION PLAN
A0.2.2 A1.1.3 — 1/8" = 1'-0"

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DIMENSION FLOOR PLANS

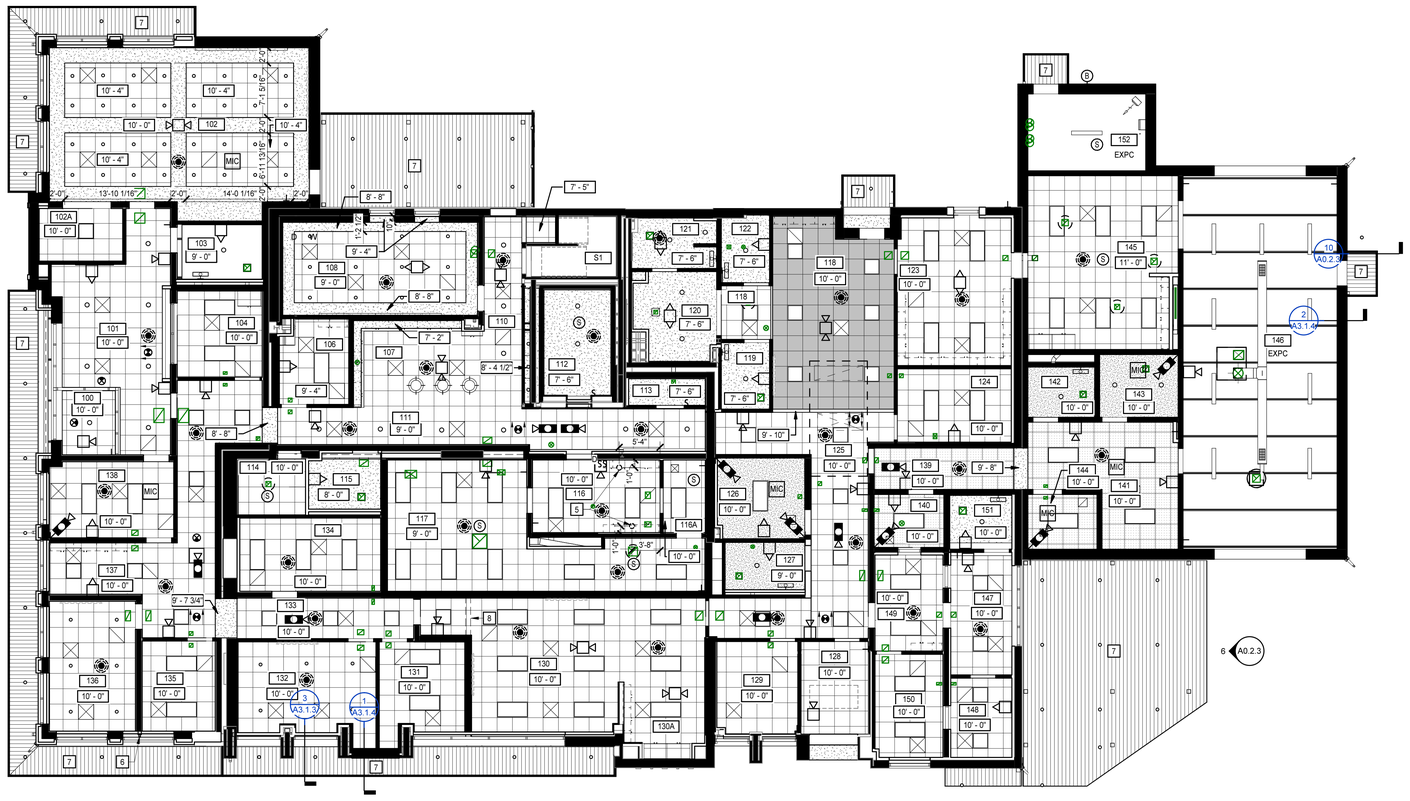
A1.1.3

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3 A0.2.2 | A1.2.1 **SECOND FLOOR - REFLECTED CEILING PLAN**

1/8" = 1'-0"



2 A0.2.2 | A1.2.1 **FIRST FLOOR - REFLECTED CEILING PLAN**

1/8" = 1'-0"

REFLECTED CEILING PLAN LEGEND

APPLIES TO A1.2.X DRAWING SERIES

REFER TO M, E & FP DRAWINGS FOR REFLECTED CEILING PLAN SYMBOLS NOT INDICATED BELOW

- A101 / nn'-nn" — SPACE NUMBER / CEILING HEIGHT, AFF UNO
- INTERIOR APPLICATIONS: GYPSUM BOARD CEILING
- EXTERIOR APPLICATIONS: GYPSUM SOFFIT BOARD OR GYPSUM SHEATHING
- SECURITY GYPSUM BOARD CEILING
- ACP-A — 2'-0" x 2'-0" LAY-IN ACOUSTICAL CEILING PANELS IN SUSPENDED GRID
- 1 HR RATED HORIZONTAL SHAFT WALL ABOVE ACP CEILING
- ACP-B — 2'-0" x 2'-0" LAY-IN ACOUSTIC CEILING PANELS IN SUSPENDED GRID - HIGH NRC/CAC
- SC-PNL — 2'-0" x 2'-0" SECURITY GRID SECURITY CEILING SYSTEM
- AP — ACCESS PANEL
- WITH OPENING — EXTERIOR WALL
- WITH OPENING — INTERIOR WALL/PARTITION TO UNDERSIDE OF DECK
- WITH OPENING — INTERIOR WALL/PARTITION TO CAP ABOVE OR TERMINATES ADJACENT TO A RATED HORIZONTAL ASSEMBLY
- WITH OPENING — INTERIOR WALL/PARTITION 4" MIN ABOVE HIGHEST ADJACENT CEILING. IF NECESSARY TO ACHIEVE RESULTS DESIRED, EXTEND WALL HEIGHT SO WALL BRACING IS NOT EXPOSED TO VIEW IN FINISHED SPACES
- INTERIOR WALL/PARTITION TO UNDERSIDE OF CEILING
- EXISTING TO REMAIN, VERIFY VERTICAL EXTENTS WHERE THE HEIGHT IMPACTS THE WORK

REFLECTED CEILING PLAN/DETAIL GENERAL NOTES

A. ALL CEILING HEIGHTS SHALL BE 9'-0" AFF UNLESS INDICATED OTHERWISE.

B. DRAWINGS INDICATE GRID LAYOUT DIAGRAMMATICALLY. REFER TO SPECIFICATIONS FOR SPECIFIC GRID LAYOUT CRITERIA AT PERIMETER CONDITIONS THAT MAY DIFFER FROM GRID LAYOUT INDICATED ON DRAWINGS.

C. CENTER CEILING MOUNTED ITEMS WITHIN CEILING PANELS, UNLESS INDICATED OTHERWISE.

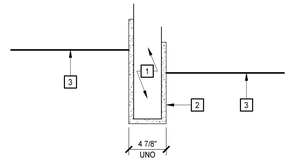
D. IF ADDITIONAL SPRINKLER HEADS ARE REQUIRED TO SATISFY CODE OR COVERAGE DENSITIES (OTHER THAN THOSE THAT MAY BE INDICATED), PROVIDE ADDITIONAL SPRINKLER HEADS AT NO ADDITIONAL COST AND OBTAIN APPROVAL OF ARCHITECT FOR LOCATION OF SUCH HEADS, IF ANY.

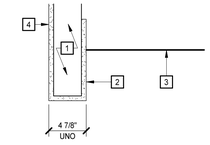
REFLECTED CEILING PLAN KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A1.2.1 - A1.2.X

1	CFSF-S
2	5/8" GYP BD, TERMINATE 4" ABV FIN CLG
3	FIN CLG: FINISH AND/OR HEIGHT AFF VARIES
4	GYP BD: EXTEND FULL HEIGHT, UNLESS INDICATED OTHERWISE
5	CEILING MOUNTED TASK EXHAUSTER
6	PARTITION GAP CLOSURE, REFER TO SPEC XXXX
7	SOFFIT BY PRE-ENGINEERED PROTECTIVE COVER MANUFACTURER
8	M1 WALL EXTENDS TO DECK





BULKHEAD DETAILS

NO SCALE

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Lic. No. 0401015628
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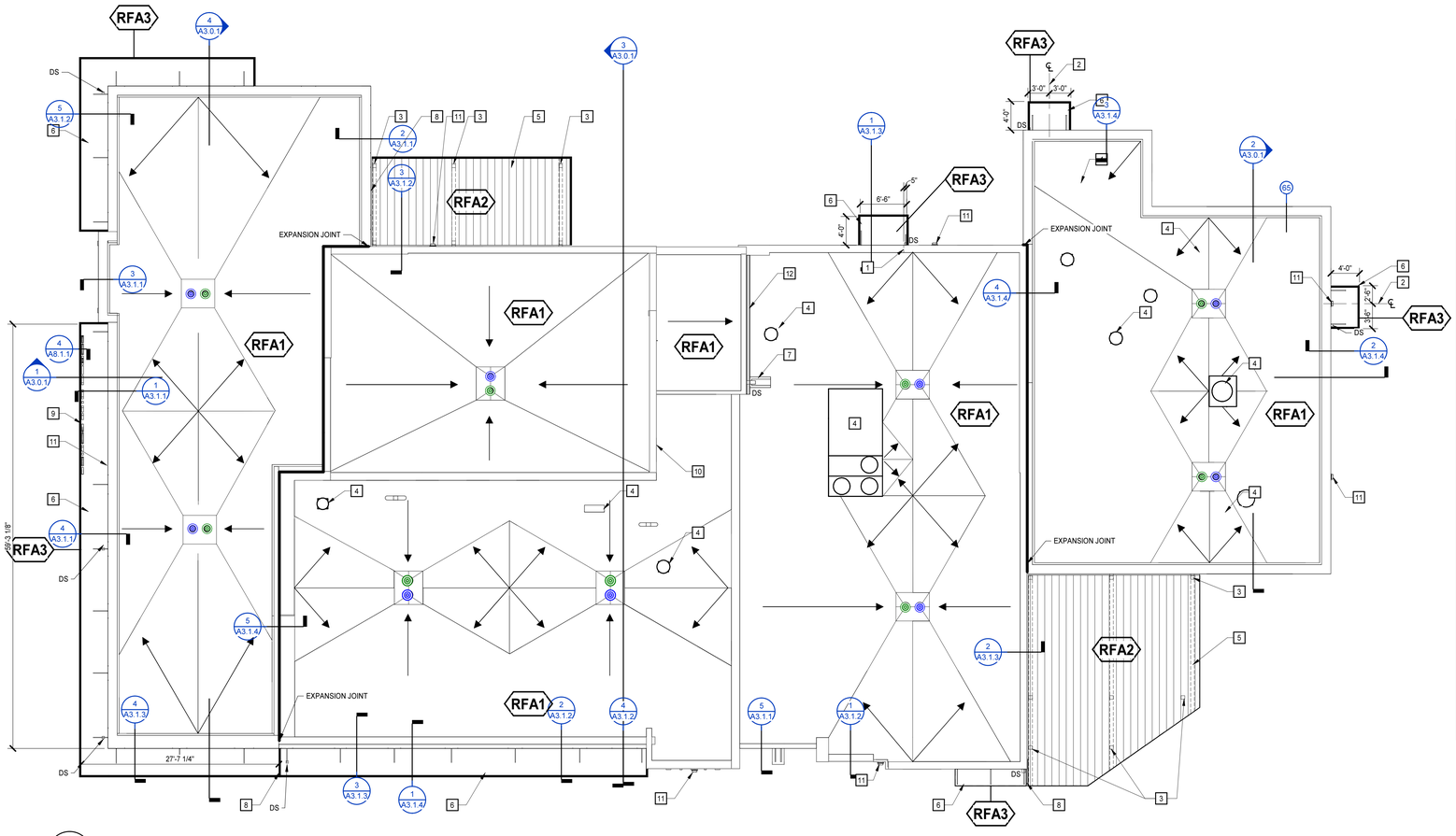
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REFLECTED CEILING PLAN

A1.2.1

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1 A1.3.1 **ROOF PLAN**
1/8" = 1'-0"

ROOF PLAN KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A1.3.1 - A1.3.X

1	WALL OPENING BELOW
2	CENTERLINE OF DOOR OPENING BELOW
3	PRE-ENGINEERED PROTECTIVE COVER INTEGRAL GUTTER SLOPED TO COLUMNS WITH INTEGRAL DOWNSPOUT, INDICATED DASHED
4	MECHANICAL EQUIPMENT
5	FREE STANDING PRE-ENGINEERED PROTECTIVE COVER W/ 8" FASCIA BY PRE-ENGINEERED COVER MFR
6	PRE-ENGINEERED PROTECTIVE COVER WITH ROD SUPPORTS W/ 8" FASCIA BY PRE-ENGINEERED COVER MFR
7	SPLASHBLOCK
8	EXPANSION JOINT
9	ALUMINUM SIGNAGE
10	ROOF ACCESS DOOR
11	OVERFLOW SCUPPER
12	GUTTER

ROOF PLAN LEGEND

APPLIES TO A1.3.X DRAWING SERIES

REFER TO M, E & FP DRAWINGS FOR ROOF SYMBOLS NOT INDICATED BELOW

- PRIMARY ROOF DRAIN AND SUMP WITH SECONDARY/EMERGENCY OVERFLOW
- GUTTER AND DOWNSPOUT (RECTANGULAR SHOWN, MAY BE ROUND IF SPECIFIED)
- ROOF ACCESS HATCH
- SCUPPER
- CRICKET
- WALKWAY PATH
- INDICATES DIRECTION OF ROOF ASSEMBLY SLOPE
- CHANGE IN ROOF ELEVATION (ARROW POINT TO THE LOWER ROOF). REFER TO WALL SECTIONS FOR ELEVATION CHANGE DIMENSIONS.

ROOF PLAN GENERAL NOTES

A. ALL ROOF ASSEMBLIES: RFA1, UNO.

B. ROOF PLAN DOES NOT INDICATE ALL EQUIPMENT AND PENETRATIONS. REFER TO OTHER DISCIPLINE'S DRAWINGS FOR QUANTITIES AND LOCATIONS OF ROOFTOP EQUIPMENT AND ASSOCIATED PENETRATIONS.

C. COORDINATE LOCATION AND SIZE OF ROOF OPENINGS AND ASSOCIATED PENETRATIONS WITH STRUCTURE.

D. ROOF DETAILS MAY NOT ENTIRELY REPRESENT ACTUAL CONSTRUCTION CONDITIONS. ACTUAL DETAIL ASSEMBLIES SHALL BE APPROVED BY ROOFING MANUFACTURER.

E. ROOF PLAN DOES NOT INDICATE ALL ROOFING DETAILS (INCLUDING BUT NOT LIMITED TO ROOF DRAINS, VTR, CURBS, EXPANSION JOINTS, ROOF HATCHES). PROVIDE MFR'S DETAILS AS REQUIRED TO SUIT SPECIFIC APPLICATION AND SPECIFICATIONS.

F. PROVIDE CRICKETS AT DRAINS, WALLS, CURBS, MECHANICAL EQUIPMENT, AND OTHER OBSTRUCTIONS SUCH THAT 1/4" PER FOOT MINIMUM POSITIVE DRAINAGE SLOPE IS MAINTAINED AT ALL SUCH AREAS.

G. PROVIDE DOUBLE-LAYER OF MEMBRANE ROOFING MATERIAL UNDER SPLASH BLOCKS.

H. CENTER ALL PENETRATIONS BETWEEN RIBS OF METAL ROOFING. PIPING, DUCTWORK AND CURBS SHALL BE OFFSET AS REQUIRED TO ACHIEVE PENETRATIONS CENTERED BETWEEN RIBS.

I. PROVIDE 1.75 INCH DEEP BY 2.25 INCH WIDE DOWNSPOUTS, UNO.

ROOF ASSEMBLIES

APPLIES TO A1.3.1 AND A1.3.X SERIES OF DRAWINGS

REPRESENTED BY n

MARK	FIRE RATED ASSEMBLY (REFER TO G1.4.1 FOR LEGEND)	REMARKS	INFORMATION (ROOF ASSEMBLIES ARE SHOWN DIAGRAMMATICALLY. REFER TO SPECS FOR REQUIRED R-VALUE AND MATERIAL THICKNESS)
RFA1			ROOF MEMBRANE COVERBOARD TAPERED ROOF INSULATION (AVERAGE R-30 MIN PER 2021 VIRGINIA ENERGY CODE PARAGRAPH C402.2.1) VAPOR/AIR BARRIER MEMBRANE SUBSTRATE BOARD MTL DECK SURFACE
RFA2			PRE-ENGINEERED FASCIA PRE-ENGINEERED FASCIA SUPPORT ANGLE PRE-ENGINEERED INTERLOCKING DECKING PRE-ENGINEERED SOFFIT PRE-ENGINEERED GUTTER TO PRE ENGINEERED COLUMNS W/ DRAINAGE, BEYOND
RFA3			PRE-ENGINEERED FASCIA PRE-ENGINEERED FASCIA SUPPORT ANGLE PRE-ENGINEERED INTERLOCKING DECKING PRE-ENGINEERED SOFFIT

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ROOF PLAN

A1.3.1

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GENERAL NOTES

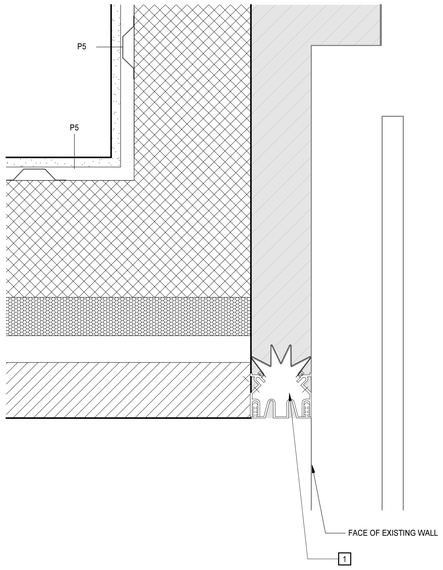
AIRSPACE BETWEEN ADDITION AND ETR WALL

FLOOR PLAN KEYNOTES

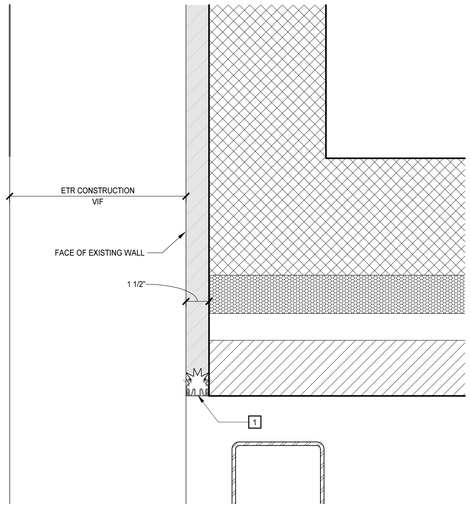
REPRESENTED BY n

APPLIES TO DRAWINGS A1.4.1 - A1.4.X

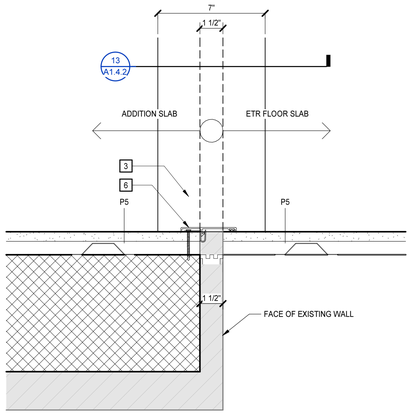
1	EXTERIOR EXPANSION JOINT COVER
2	AIR BARRIER MEMBRANE
3	FLOOR EXPANSION JOINT COVER
4	LIGHT GAUGE ANGLE
5	CFSF
6	INTERIOR BUILDING EXPANSION JOINT COVER
7	GYP BD



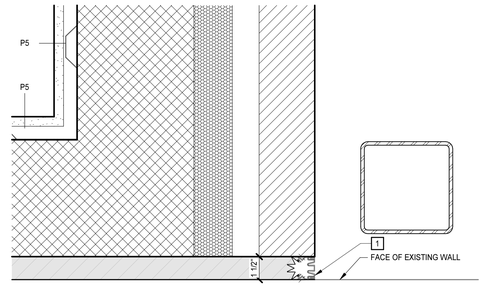
7 PLAN DETAIL
A1.1.2 | A1.4.1 3" = 1'-0"



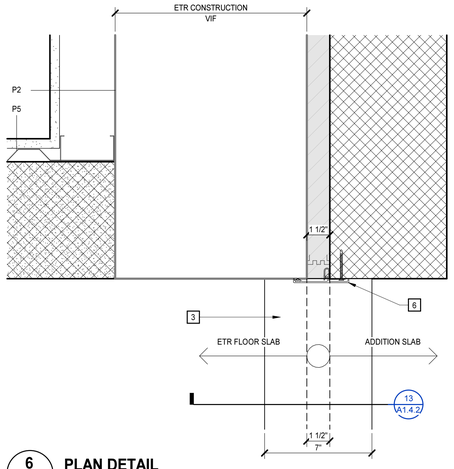
5 PLAN DETAIL
A1.1.2 | A1.4.1 3" = 1'-0"



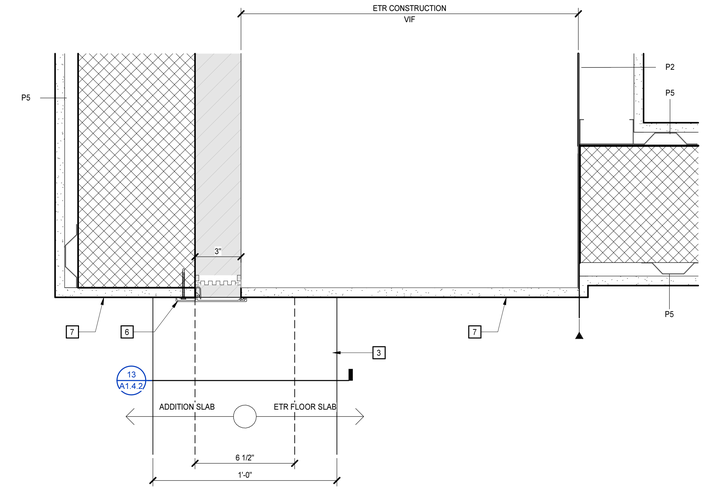
4 PLAN DETAIL
A1.1.2 | A1.4.1 3" = 1'-0"



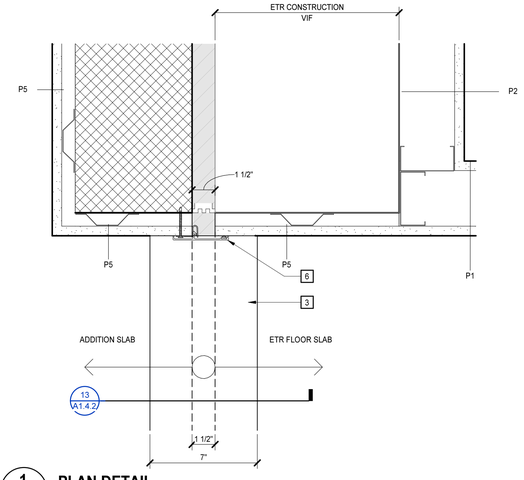
2 PLAN DETAIL
A1.1.2 | A1.4.1 3" = 1'-0"



6 PLAN DETAIL
A1.1.2 | A1.4.1 3" = 1'-0"



3 PLAN DETAIL
A1.1.2 | A1.4.1 3" = 1'-0"



1 PLAN DETAIL
A1.1.2 | A1.4.1 3" = 1'-0"

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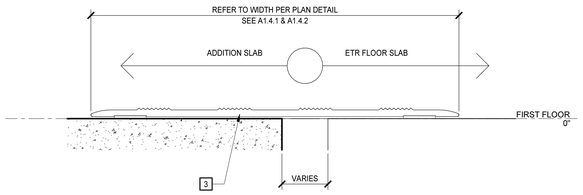
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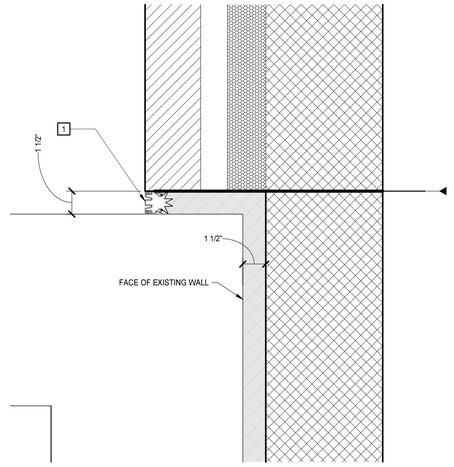
FLOOR PLAN DETAILS

A1.4.1

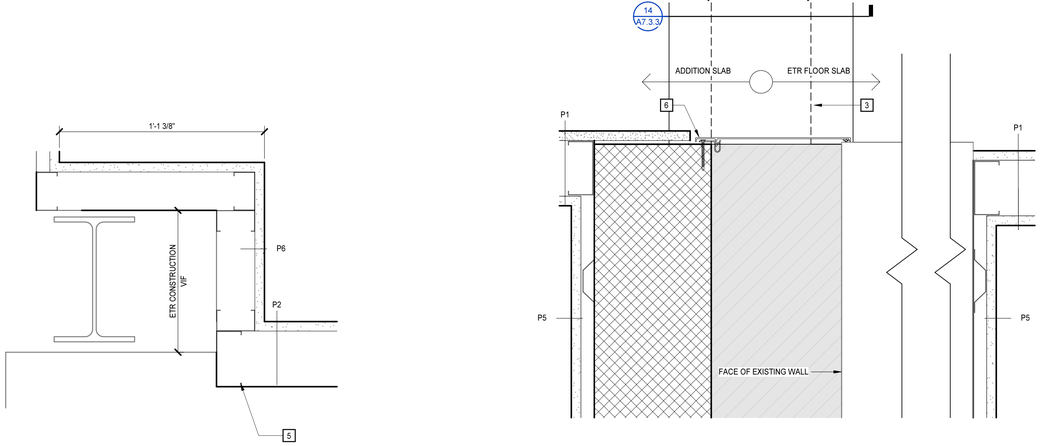
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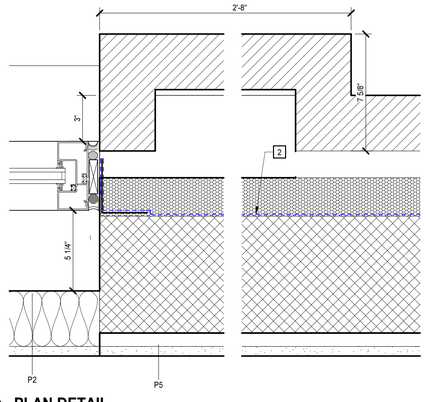
13 A1.4.1 A1.4.2 **FLOOR EXPANSION JOINT COVER** 6" = 1'-0"



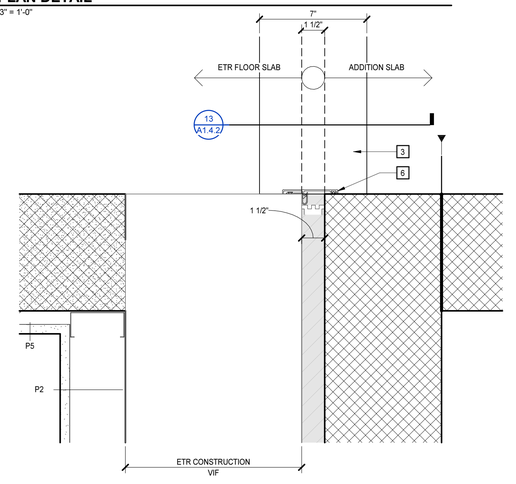
10 A1.1.2 A1.4.2 **PLAN DETAIL** 3" = 1'-0"



12 A1.1.2 A1.4.2 **PLAN DETAIL** 3" = 1'-0"



11 A1.1.2 A1.4.2 **PLAN DETAIL** 3" = 1'-0"



8 A1.1.2 A1.4.2 **PLAN DETAIL** 3" = 1'-0"

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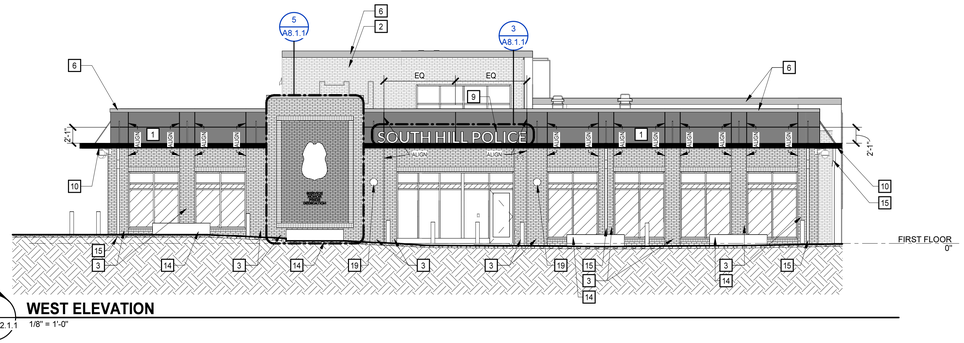
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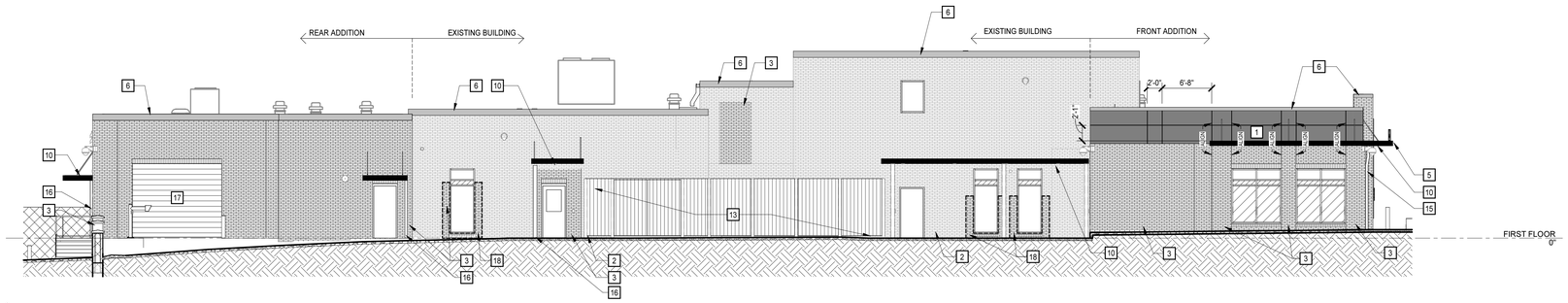
FLOOR PLAN DETAILS

A1.4.2

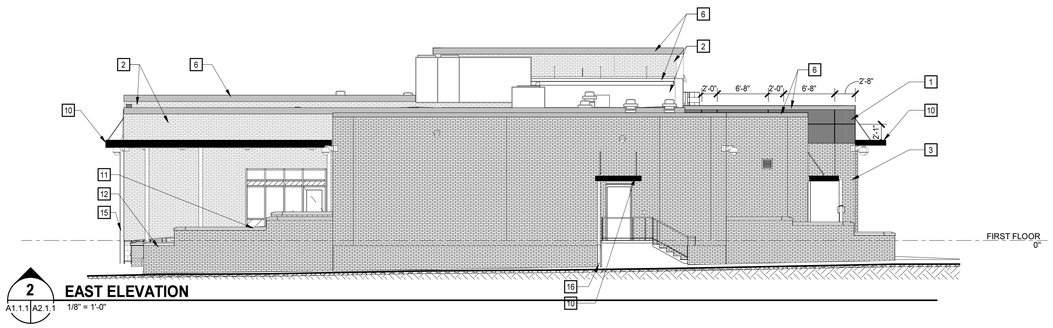
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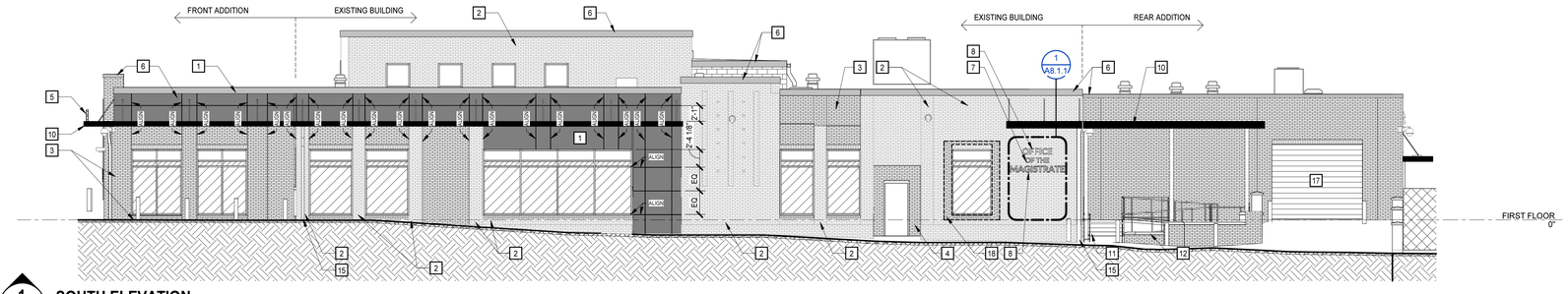
4 A1.1.1 A2.1.1 **WEST ELEVATION**
1/8" = 1'-0"



3 A1.1.1 A2.1.1 **NORTH ELEVATION**
1/8" = 1'-0"



2 A1.1.1 A2.1.1 **EAST ELEVATION**
1/8" = 1'-0"



1 A1.1.1 A2.1.1 **SOUTH ELEVATION**
1/8" = 1'-0"

GENERAL NOTES

A. CLEAN BRICK FACADES.

B. POINT UP CRACKED FACADE AND FAILING MORTAR LOCATIONS.

EXTERIOR ELEVATION LEGEND

- MCM WALL PANELS
- EX BRICK
- BRICK COLOR 1
- BRICK COLOR 2
- SPANDREL PANEL COLOR 1
- SPANDREL PANEL COLOR 2
- ROOF COPING

BUILDING ELEVATION KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A2.1.1 - A2.1.X

1	MCM WALL PANELS
2	EX BRICK
3	BRICK COLOR 1
4	BRICK COLOR 2
5	ALUMINUM SIGNAGE
6	PRE-FINISHED ALUMINUM COPING
7	8" ALUMINUM SIGNAGE
8	10" ALUMINUM SIGNAGE
9	1'-6" ALUMINUM SIGNAGE
10	PRE-ENGINEERED PROTECTIVE COVER W/ 8" FASCIA BY PRE-ENGINEERED COVER MFR
11	STAIR
12	RAMP
13	MECHANICAL YARD WALL, REFER TO A0.2.2
14	CORTEN STEEL PLANTER
15	ALUMINUM DOWNSPOUT TO UNDERGROUND BOOT WITH INGROUND CLEANOUT, REFER TO A1.3.1
16	ALUMINUM DOWNSPOUT, REFER TO A1.3.1
17	OVERHEAD COILING DOOR
18	REINSTALL SALVAGED BRICK. COORDINATE DIMENSIONS WITH EXISTING COURSING. TOOTH IN BRICK AT JAMB TO MAKE SOLID SURFACE AT DOOR, BOTH SIDES
19	POLICE GLOBE LIGHT, REFER TO ELECTRICAL

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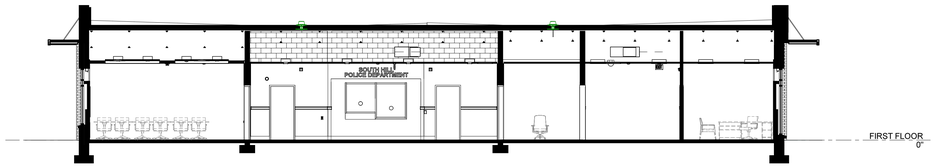
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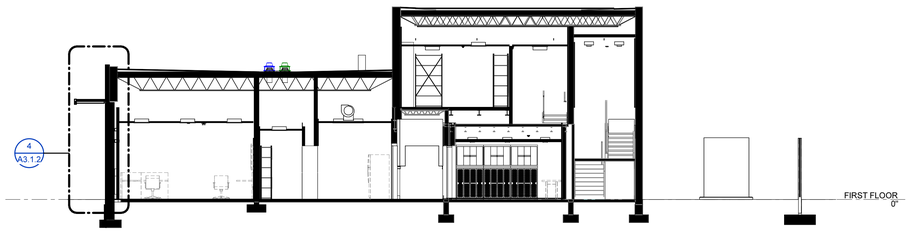
EXTERIOR BUILDING ELEVATIONS

A2.1.1

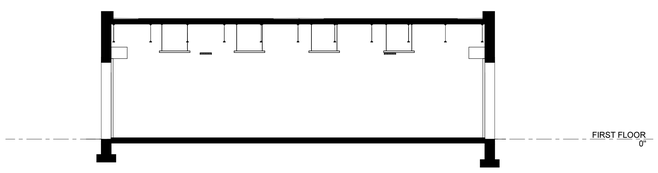
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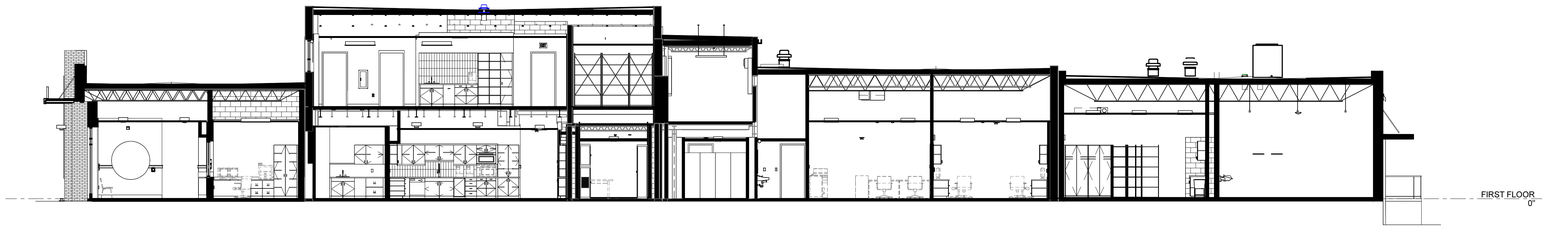
4 BUILDING SECTION
A1.1.1 | A3.0.1 1/8" = 1'-0"



3 BUILDING SECTION
A1.1.1 | A3.0.1 1/8" = 1'-0"



2 BUILDING SECTION
A1.1.1 | A3.0.1 1/8" = 1'-0"



1 BUILDING SECTION
A1.1.1 | A3.0.1 1/8" = 1'-0"

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DATE	DESCRIPTION

BUILDING SECTIONS

A3.0.1

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GENERAL NOTES

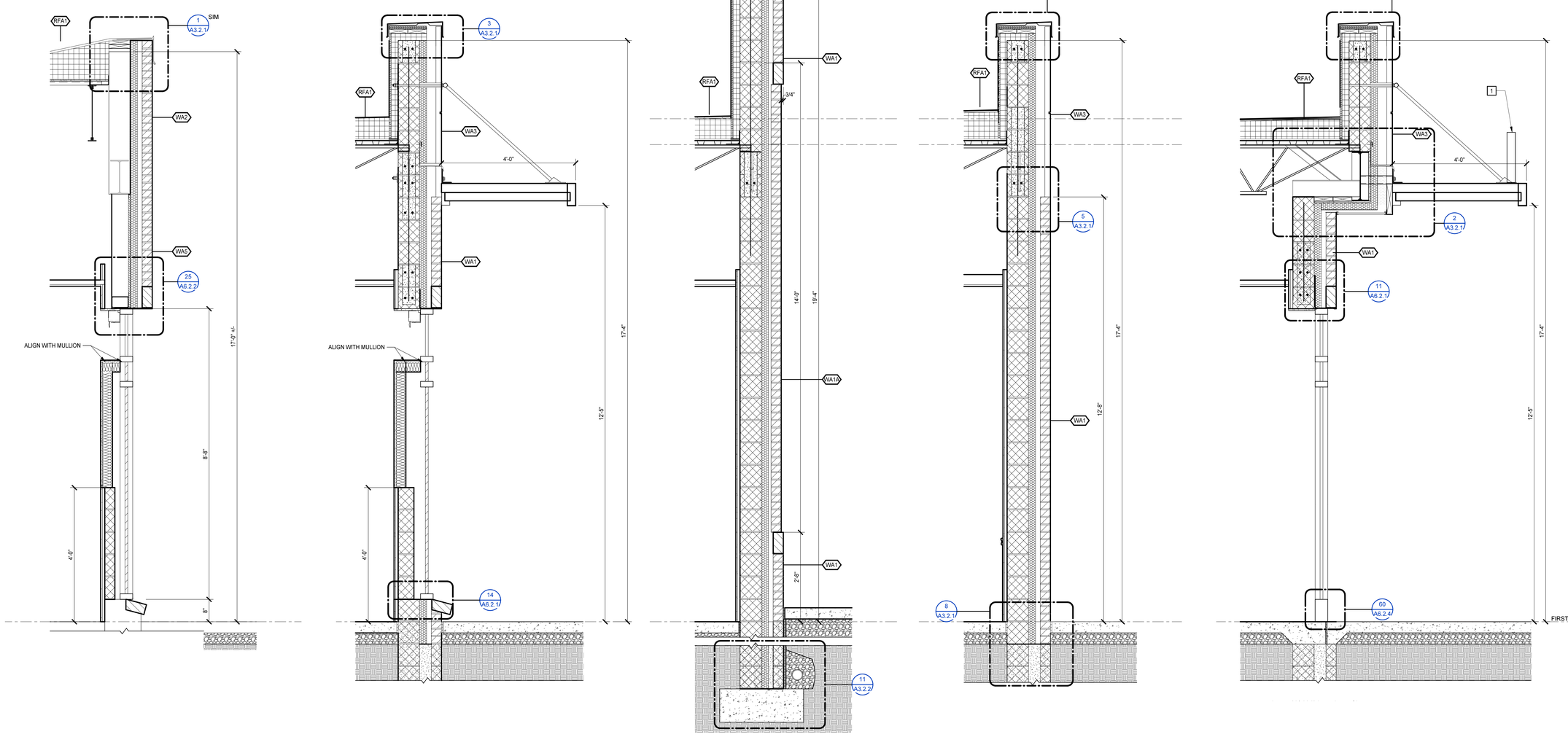
A. FIELD VERIFY ELEVATION OF CANOPY REQUIRED TO PASS ABOVE EXISTING EXTERIOR BRICK PILASTERS. THIS ELEVATION SHALL REMAIN CONSTANT AT THE PERIMETER TENSION ROD CANOPIES

WALL SECTION KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A3.1.1 - A3.1.X

1 1'-6" ALUMINUM SIGNAGE



5 WALL SECTION (A1.1.1 A3.1.1) 3/4" = 1'-0"

4 WALL SECTION (A1.1.1 A3.1.1) 3/4" = 1'-0"

3 WALL SECTION (A1.1.1 A3.1.1) 3/4" = 1'-0"

2 WALL SECTION (A1.1.1 A3.1.1) 3/4" = 1'-0"

1 WALL SECTION (A1.1.1 A3.1.1) 3/4" = 1'-0"

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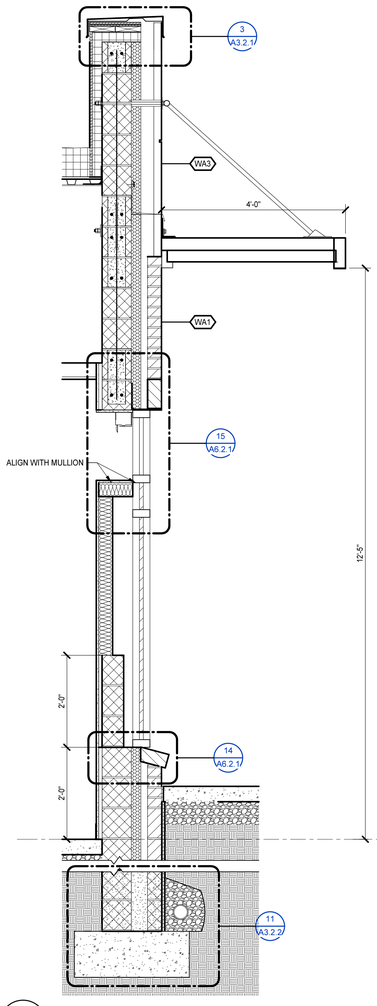
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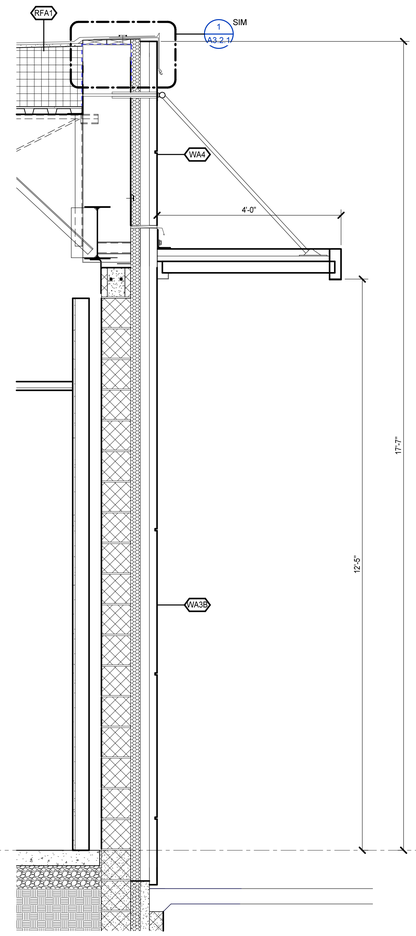
EXTERIOR WALL SECTIONS

A3.1.1

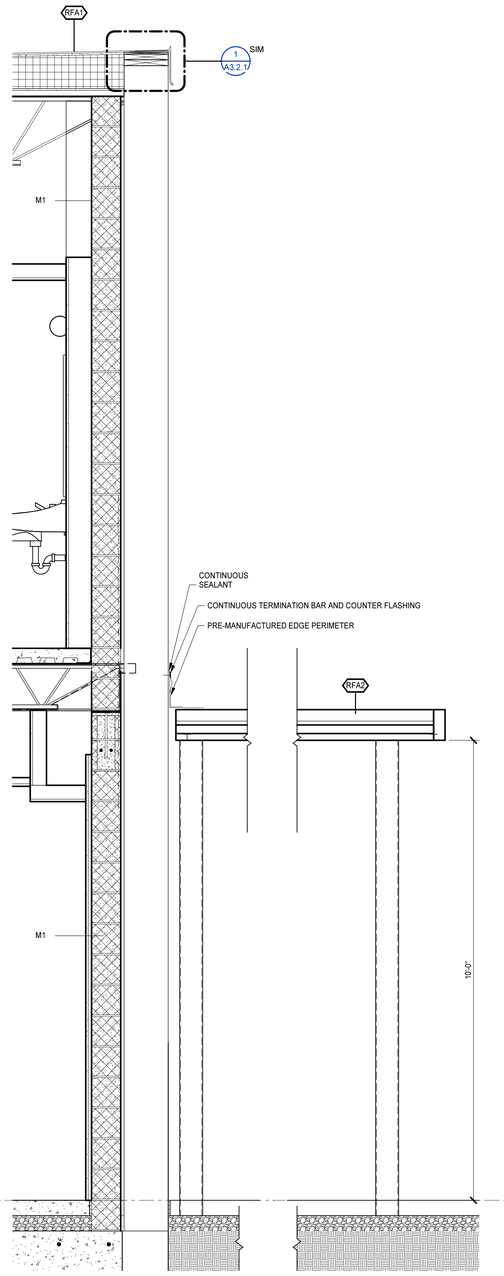
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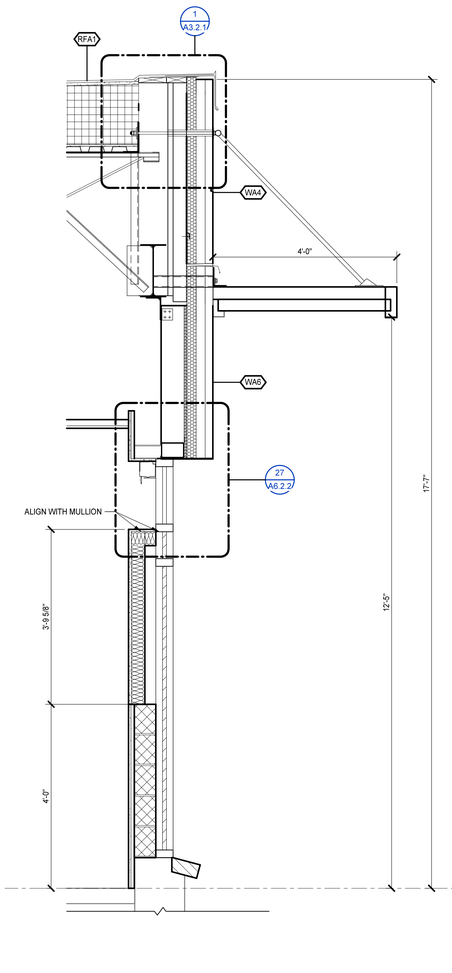
5 WALL SECTION
A1.1.1 A3.1.2 3/4" = 1'-0"



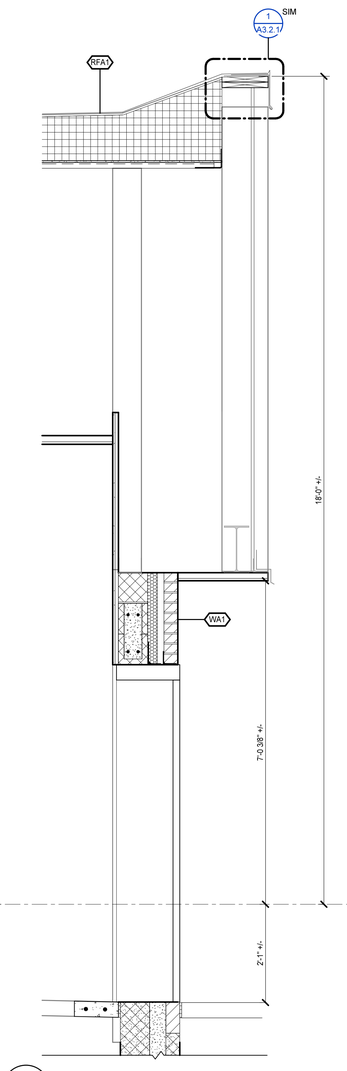
4 WALL SECTION
A1.1.1 A3.1.2 3/4" = 1'-0"



3 WALL SECTION
A1.1.1 A3.1.2 3/4" = 1'-0"



2 WALL SECTION
A1.1.1 A3.1.2 3/4" = 1'-0"



1 WALL SECTION
A1.1.1 A3.1.2 3/4" = 1'-0"

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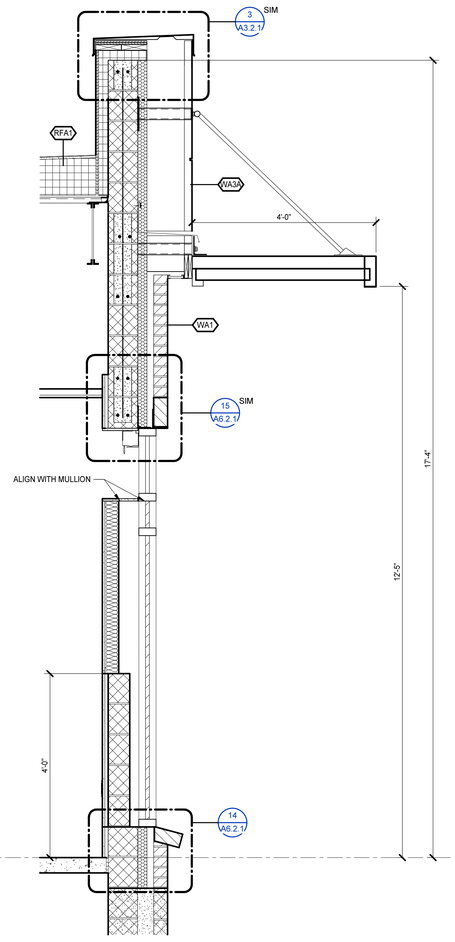
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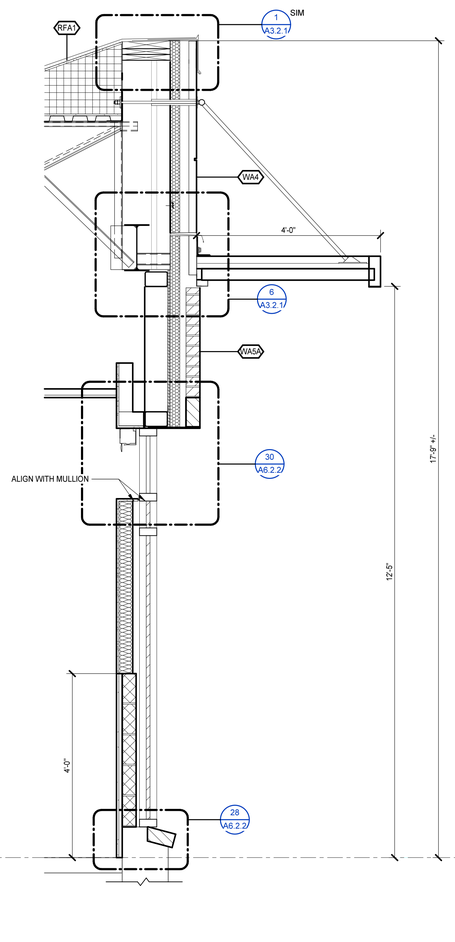
EXTERIOR WALL SECTIONS

A3.1.2

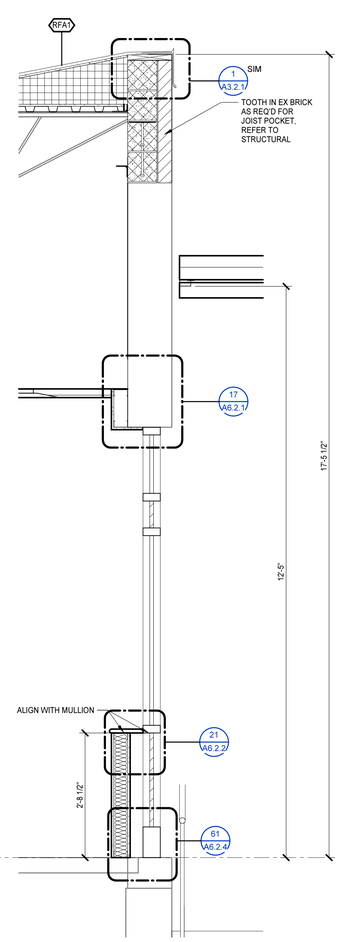
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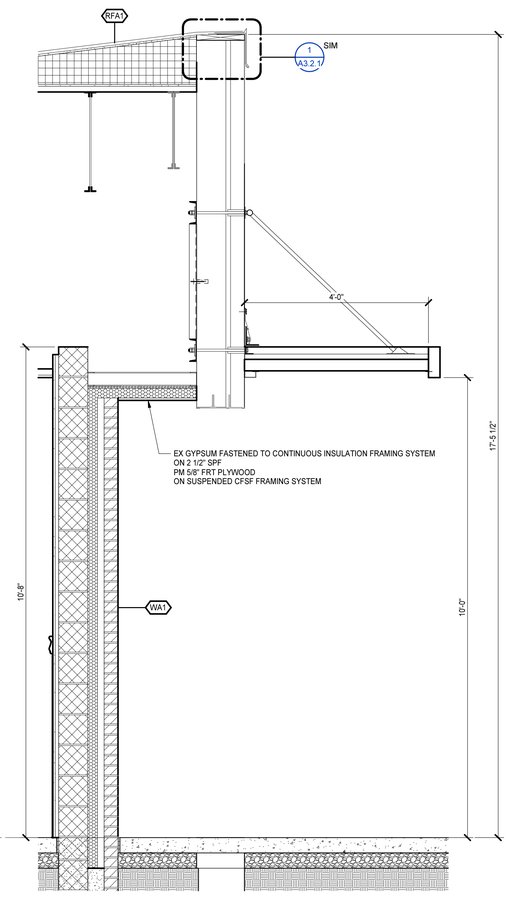
4 WALL SECTION
A1.1.1 A3.1.3 3/4" = 1'-0"



3 WALL SECTION
A1.1.1 A3.1.3 3/4" = 1'-0"



2 WALL SECTION
A1.1.1 A3.1.3 3/4" = 1'-0"



1 WALL SECTION
A1.1.1 A3.1.3 3/4" = 1'-0"

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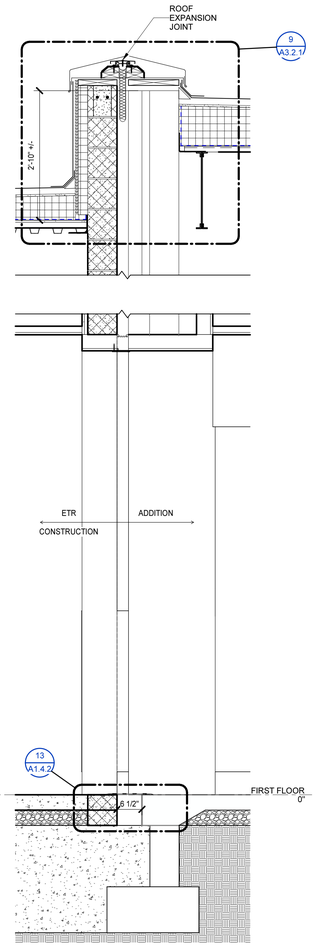
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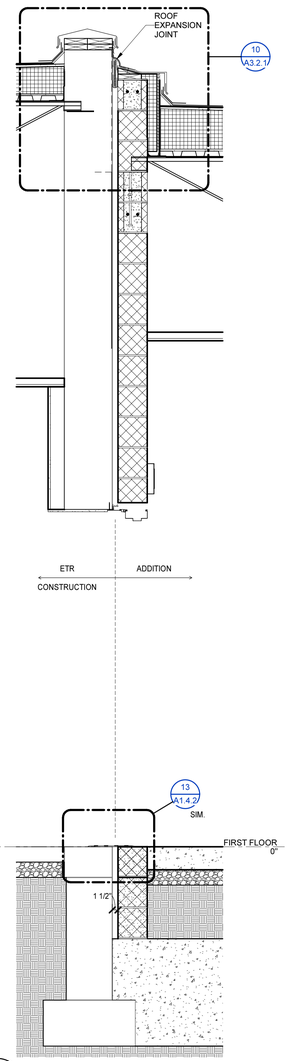
EXTERIOR WALL SECTIONS

A3.1.3

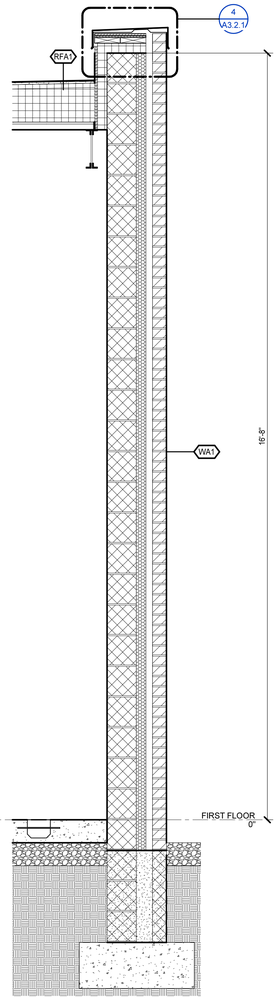
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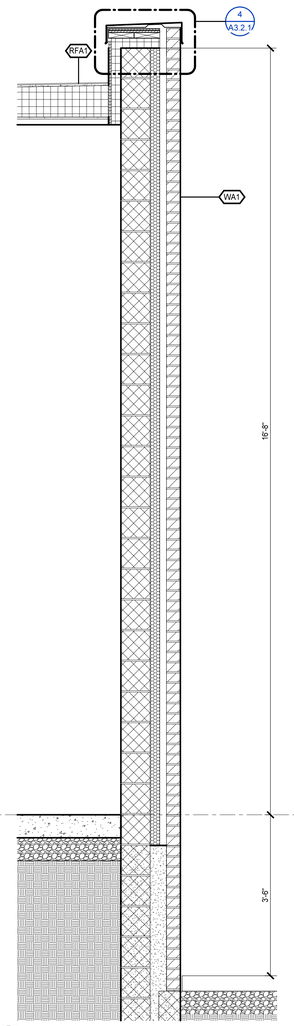
5 WALL SECTION
A1.1.1 A3.1.4 3/4" = 1'-0"



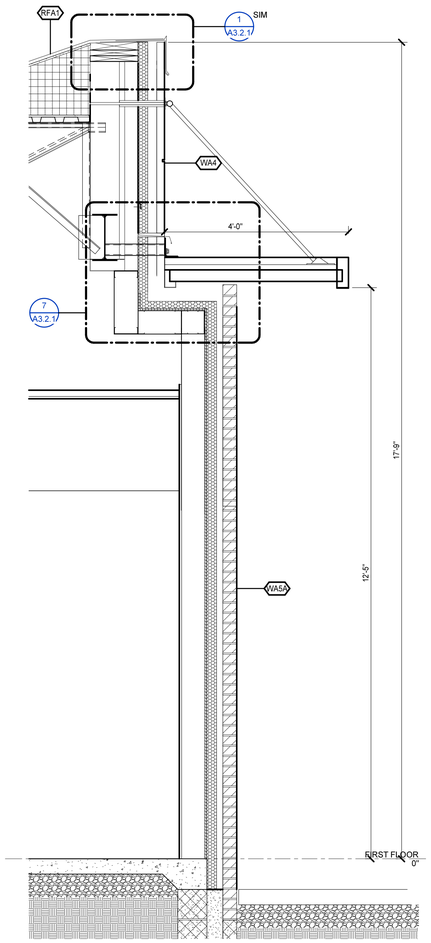
4 WALL SECTION
A1.1.1 A3.1.4 3/4" = 1'-0"



3 WALL SECTION
A1.1.1 A3.1.4 3/4" = 1'-0"



2 WALL SECTION
A1.1.1 A3.1.4 3/4" = 1'-0"



1 WALL SECTION
A1.1.1 A3.1.4 3/4" = 1'-0"

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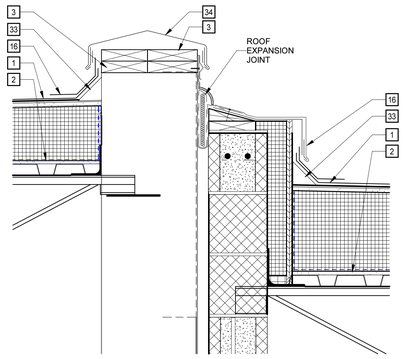
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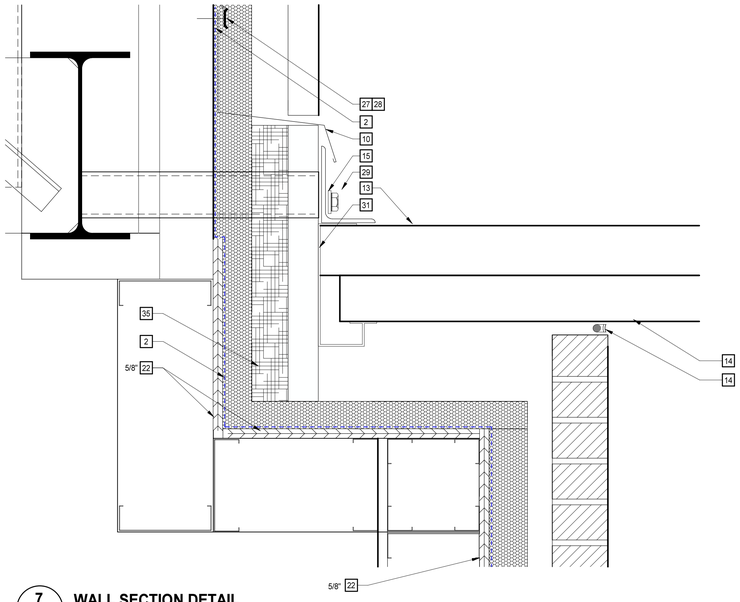
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DATE	DESCRIPTION

EXTERIOR WALL SECTIONS

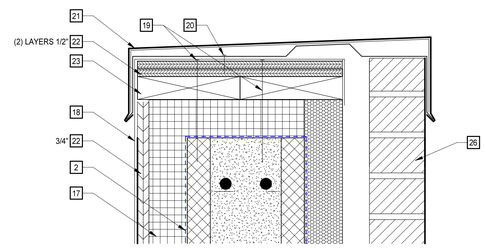
A3.1.4



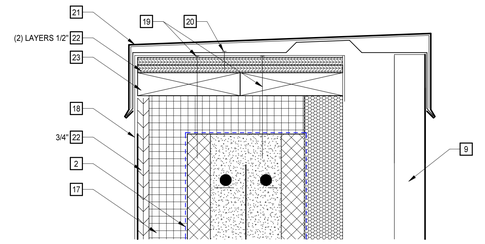
10 WALL SECTION DETAIL
A3.1.4 A3.2.1 1 1/2" = 1'-0"



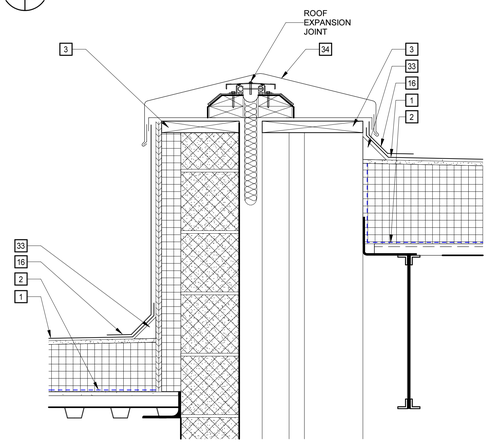
7 WALL SECTION DETAIL
A3.1.4 A3.2.1 3" = 1'-0"



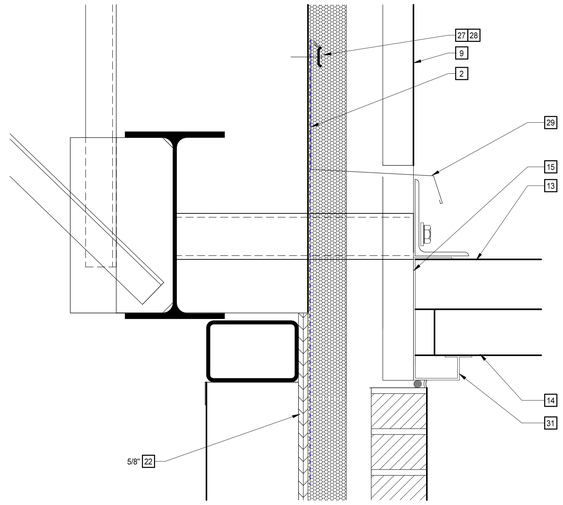
4 WALL SECTION DETAIL
A3.1.1 A3.2.1 3" = 1'-0"



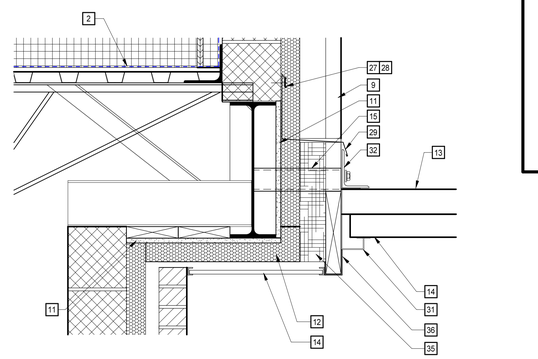
3 WALL SECTION DETAIL
A3.1.1 A3.2.1 3" = 1'-0"



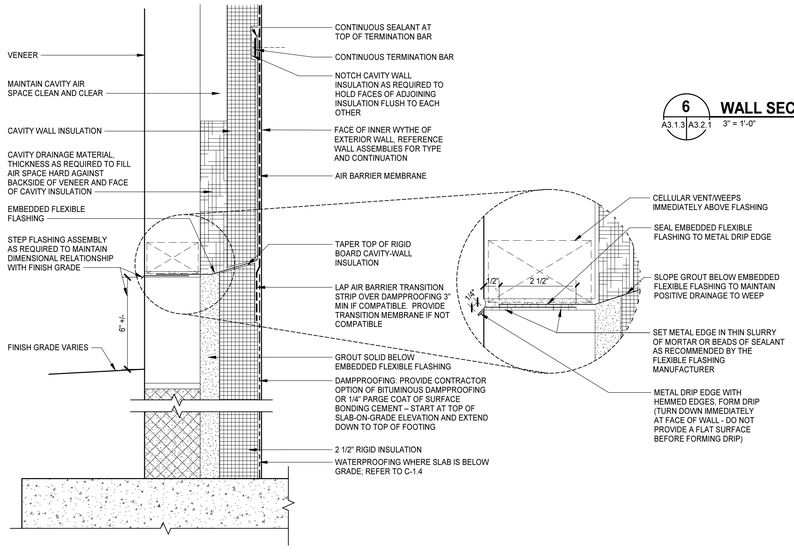
9 WALL SECTION DETAIL
A3.1.4 A3.2.1 1 1/2" = 1'-0"



6 WALL SECTION DETAIL
A3.1.3 A3.2.1 3" = 1'-0"

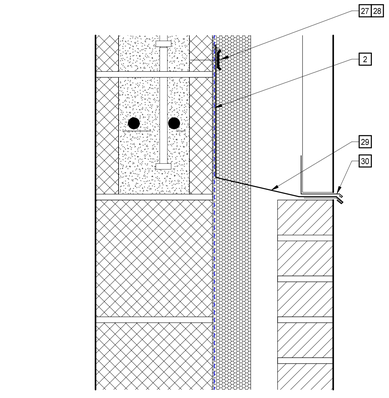


2 WALL SECTION DETAIL
A3.1.1 A3.2.1 1 1/2" = 1'-0"

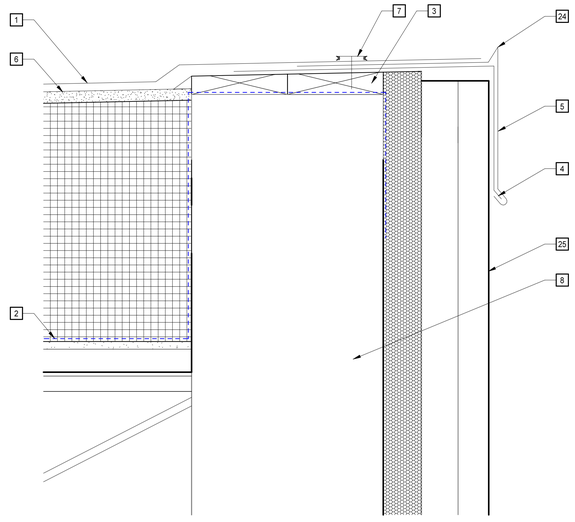


NOTE: REFER TO STRUCTURAL DRAWINGS FOR FOUNDATION PLANS, NOTES, AND DETAILS FOR ACTUAL FOUNDATION AND FOOTING CONSTRUCTION AND DEPTHS.

8 BASE-OF-EXTERIOR CAVITY WALL
A3.1.1 A3.2.1 3" = 1'-0"



5 WALL SECTION DETAIL
A3.1.1 A3.2.1 3" = 1'-0"



1 WALL SECTION DETAIL
A3.1.1 A3.2.1 3" = 1'-0"

WALL SECTION DETAIL KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A3.2.1 - A3.2.X

1	ROOF MEMBRANE
2	AIR BARRIER MEMBRANE
3	PRESSURE PRESERVATIVE TREATED WOOD
4	PRE-FINISHED ALUMINUM GRAVEL STOP
5	PRE-FINISHED ALUMINUM BRAKE METAL TRIM OVER GRAVEL STOP
6	COVERBOARD
7	ROOFING TERMINATION STRIP
8	EX WALL
9	MCM PANEL SYSTEM
10	FLASHING WITH DRIP EDGE
11	5/8" GPYSUM SHEATHING
12	2 1/2" SPF
13	PRE-ENGINEERED PROTECTIVE COVER
14	SOFFIT BY PRE-ENGINEERED PROTECTIVE COVER MANUFACTURER
15	CONNECTION TO HSS BY CANOPY MFR
16	FLASHING PER ROOF MFR STANDARD DETAIL
17	2 1/2" RIGID INSULATION, UNO
18	ROOF MEMBRANE, EXTEND OVER TOP OF PARAPET
19	SHEATHING ANCHOR
20	ANCHOR
21	PRE-FINISHED ALUMINUM COPING
22	FRT PLYWOOD
23	2X PPT WOOD BLOCKING
24	BUILD UP GRAVEL STOP AS REQUIRED TO MATCH ADJACENT METAL COPING HEIGHT
25	REFER TO WALL SECTION FOR WALL TYPE
26	BRICK
27	CONTINUOUS TERMINATION BAR
28	CONTINUOUS SEAL AT TOP OF TERMINATION BAR
29	THRU WALL FLASHING WITH METAL HEMMED DRIP EDGE
30	MCM FLASHING TO MATCH MCM FINISH
31	8" FASCIA BY PRE-ENGINEERED PROTECTIVE COVER
32	ANGLE PROVIDED BY PRE-ENGINEERED PROTECTED COVER MANUFACTURER
33	CONTINUOUS CANT STRIP
34	CAP FLASHING
35	CAVITY DRAINAGE MATERIAL
36	BREAK METAL

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A3.2.1

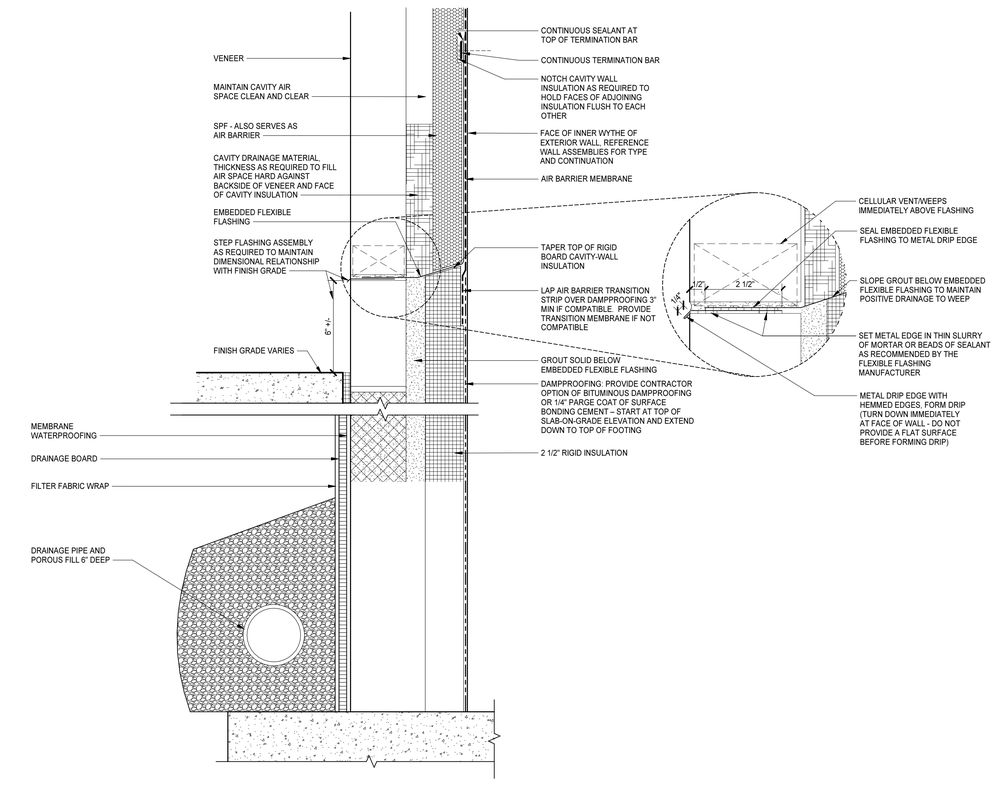
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WALL SECTION DETAIL KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A3.2.1 - A3.2.X

1	ROOF MEMBRANE
2	AIR BARRIER MEMBRANE
3	PRESSURE PRESERVATIVE TREATED WOOD
4	PRE-FINISHED ALUMINUM GRAVEL STOP
5	PRE-FINISHED ALUMINUM BRAKE METAL TRIM OVER GRAVEL STOP
6	COVERBOARD
7	ROOFING TERMINATION STRIP
8	EX WALL
9	MCM PANEL SYSTEM
10	FLASHING WITH DRIP EDGE
11	5/8" GPYSUM SHEATHING
12	2 1/2" SPF
13	PRE-ENGINEERED PROTECTIVE COVER
14	SOFFIT BY PRE-ENGINEERED PROTECTIVE COVER MANUFACTURER
15	CONNECTION TO HSS BY CANOPY MFR
16	FLASHING PER ROOF MFR STANDARD DETAIL
17	2 1/2" RIGID INSULATION, UNO
18	ROOF MEMBRANE, EXTEND OVER TOP OF PARAPET
19	SHEATHING ANCHOR
20	ANCHOR
21	PRE-FINISHED ALUMINUM COPING
22	FRT PLYWOOD
23	2X PPT WOOD BLOCKING
24	BUILD UP GRAVEL STOP AS REQUIRED TO MATCH ADJACENT METAL COPING HEIGHT
25	REFER TO WALL SECTION FOR WALL TYPE
26	BRICK
27	CONTINUOUS TERMINATION BAR
28	CONTINUOUS SEAL AT TOP OF TERMINATION BAR
29	THRU WALL FLASHING WITH METAL HEMMED DRIP EDGE
30	MCM FLASHING TO MATCH MCM FINISH
31	8" FASCIA BY PRE-ENGINEERED PROTECTIVE COVER
32	ANGLE PROVIDED BY PRE-ENGINEERED PROTECTED COVER MANUFACTURER
33	CONTINUOUS CANT STRIP
34	CAP FLASHING
35	CAVITY DRAINAGE MATERIAL
36	BREAK METAL



NOTE: REFER TO STRUCTURAL DRAWINGS FOR FOUNDATION PLANS, NOTES, AND DETAILS FOR ACTUAL FOUNDATION AND FOOTING CONSTRUCTION AND DEPTHS.

11 A3.1.1 | A3.2.2

BASE-OF-EXTERIOR CAVITY WALL

3" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026

SUBMITTAL: BID SET

REVISIONS

DATE	DESCRIPTION

WALL SECTION DETAILS

A3.2.2

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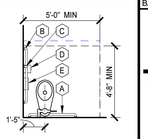
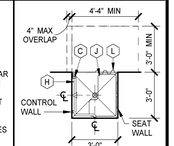
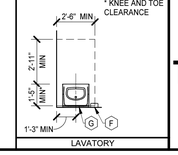
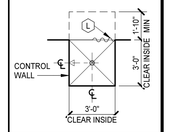
TOILET ASSEMBLIES, SCHEDULE AND ENLARGED PLAN GENERAL NOTES

A. PLAN DIMENSIONS ARE TO FACE OF WALL OR PARTITION. WHERE APPLIED FINISHES OCCUR-SUCH AS CERAMIC TILE-DIMENSIONS ARE TO FACE OF APPLIED FINISH. FOR WAINSCOTS, FLOOR PLAN DIMENSIONS ARE TO FACE OF WAINSCOT MATERIAL. APPLIED FINISHES ARE NOT ALLOWED TO REDUCE CLEAR DIMENSIONS. "APPLIED FINISHES" IN THIS CASE DO NOT INCLUDE TRIM, BASE, AND ACOUSTIC WALL PANELS.

B. CLEAR DIMENSIONS ARE TO FACE OF APPLIED WALL AND PARTITION FINISHES.

TOILET ASSEMBLIES

APPLIES TO DRAWINGS A5.1.1 - A5.X.X
REPRESENTED BY (TA#)

MARK	REMARKS	PLAN	MARK	REMARKS	PLAN
BARRIER FREE **TA7**		 WATER CLOSET	BARRIER FREE **TA13**	HOLD 3'-0" SHOWER DIMENSIONS, WHICH ARE ABSOLUTE CLEAR INSIDE FINISH DIMENSIONS, MEASURED AT THE CENTER POINT OF OPPOSING SIDES	 SHOWER - TRANSFER STYLE
BARRIER FREE **TA11**	CENTER (G) OVER LAVATORY	 LAVATORY	**TA14**		 SHOWER

LEGEND NOTES:

A. HANDING/ORIENTATION MAY VARY. REFER TO PLANS FOR PROPER ORIENTATION.

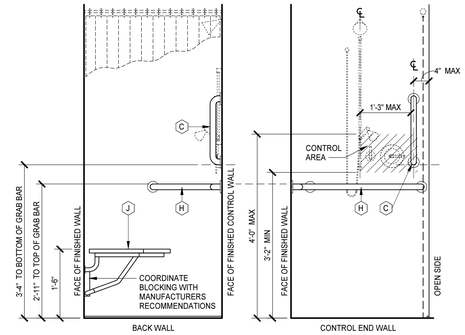
B. PLUMBING FIXTURE GRAPHICS IN THIS LEGEND ARE REPRESENTATIVE ONLY. ACTUAL PLUMBING FIXTURES MAY VARY.

C. PROVIDE TOILET COMPARTMENT COAT HOOK WITH BUMPER, MOUNTED CENTERED ON INSIDE FACE OF TOILET COMPARTMENT DOORS, AT 3'-11" TO TOP.

TOILET ACCESSORIES SCHEDULE

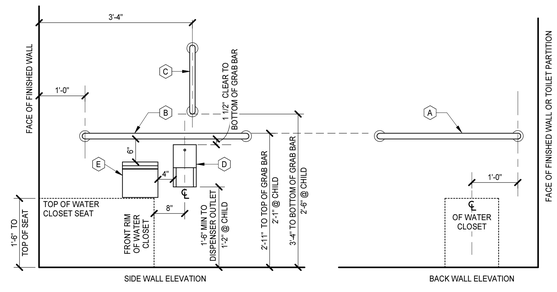
MARK	DESCRIPTION	MOUNTING HEIGHT	REMARKS
A	36" HORIZONTAL GRAB BAR	REFER TO WATER CLOSET ELEVATIONS	
B	42" HORIZONTAL GRAB BAR	REFER TO WATER CLOSET ELEVATIONS	
C	18" VERTICAL GRAB BAR	REFER TO WATER CLOSET ELEVATIONS	
D	TOILET TISSUE DISPENSER	REFER TO WATER CLOSET ELEVATIONS	
E	SANITARY NAPKIN DISPOSAL	REFER TO WATER CLOSET ELEVATIONS	
F	SOAP DISPENSER	3'-4" AFF TO DISPENSING OUTLET	
G	MIRROR (18" x 36"), OVER LAV AND COUNTERTOP	3'-4" AFF TO BOTTOM OF REFLECTIVE SURFACE	
H	GRAB BAR ASSEMBLY	REFER TO SHOWER ELEVATIONS	
J	L-SHAPED FOLDING SHOWER SEAT	1'-6" TO SEAT SURFACE	
K	DIAPER CHANGING STATION	3'-8" AFF TO TOP OF CLOSED STATION	
L	FOLD DOWN BENCH	3'-8" AFF TO TOP OF CLOSED STATION	
M	COMBINATION TOWEL DISPENSER/WASTE RECEPTACLE	48" AFF MAX TO PAPER TOWEL DISPENSING SLOT	
T	MOP & BROOM HOLDER W/ SHELF	5'-0" AFF TO TOP OF SHELF	

1. ACCESSORY ITEMS ARE IDENTIFIED BY ⬡ ON PLANS. LETTERS CORRESPOND TO SCHEDULE ABOVE.
2. ACTUAL DIMENSIONS OF ACCESSORIES MAY VARY. COORDINATE DIFFERENCES, IF ANY.
3. REFER TO ALL CASEWORK ELEVATIONS FOR ADDITIONAL TOILET ACCESSORY LOCATIONS.
4. PROVIDE MOP AND BROOM HOLDER W/ SHELF ⬡ AT ALL CUSTODIAL/JANITORIAL SINKS. MOUNT AT 5'-0" AFF TO CENTERLINE AND LOCATE ON SIDE WALL OF SINK (NOT ON WALL ABOVE FAUCET).
5. PROVIDE ROBE HOOK ON INTERIOR FACE OF ALL TOILET ROOM DOORS WHEREIN ONLY ONE WATER CLOSET IS PROVIDED. MOUNT AT 3'-11" AFF TO TOP.



TRANSFER-TYPE SHOWER ELEVATIONS

3/4" = 1'-0"



WATER CLOSET ELEVATIONS

3/4" = 1'-0"

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DATE	DESCRIPTION

TOILET ASSEMBLIES, SCHEDULE AND ENLARGED PLANS

A5.1.1

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DETENTION EQUIPMENT SCHEDULE

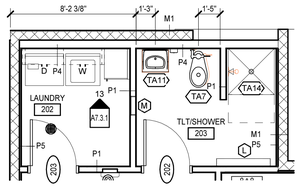
NO	DESCRIPTION	MOUNTING HEIGHT	DETAIL	NOTES
D1	DETENTION MIRROR, SINGLE	REFER TO DETAIL	2/A5.3.1	
D3	GRAB BAR, ANTI-LIGATURE, 42"	REFER TO DETAIL	3/A5.3.1	
D4	GRAB BAR, ANTI-LIGATURE, 12"	REFER TO DETAIL	3/A5.3.1	
D5	RECESSED TOILET PAPER ROLL HOLDER	REFER TO DETAIL	4/A5.3.1	
D8	EVIDENCE PASS THRU LOCKERS			
T11	WALL MOUNTED PENAL WATER CLOSET			

ENLARGED PLAN KEYNOTES

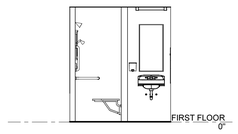
REPRESENTED BY n

APPLIES TO DRAWINGS A5.2.1 - A5.2.X

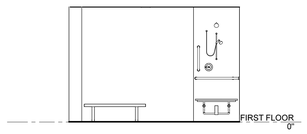
1	PASS-THRU EVIDENCE LOCKERS
2	36"W x 18"D METAL SHELVING, TYPICAL OF 4
3	42"Wx 18"D METAL SHELVING, TYPICAL OF 10
4	48"W x 18" METAL SHELVING, TYPICAL OF 10
5	48"W x 24"D METAL SHELVING, TYPICAL OF 10
6	HIGH DENISTY EVIDENCE STORAGE
7	STAINLESS STEEL DETENTION DESK
8	POLYCOM MONITOR WITH ARM TO SWING INFRONT OF WINDOW, NIC
9	MONITOR IN SECURE ENCLOSURE, NIC
10	ACCESS DOOR



17 A1.1.1 A5.2.1 25 **ENLARGED PLAN**
1/4" = 1'-0"



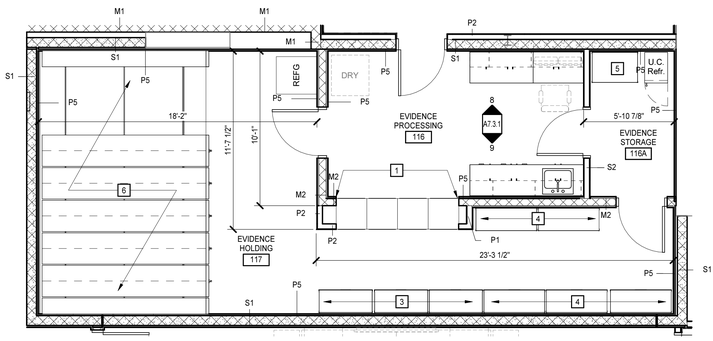
16 A1.1.1 A5.2.1 30 **SHOWER 121 EAST**
1/4" = 1'-0"



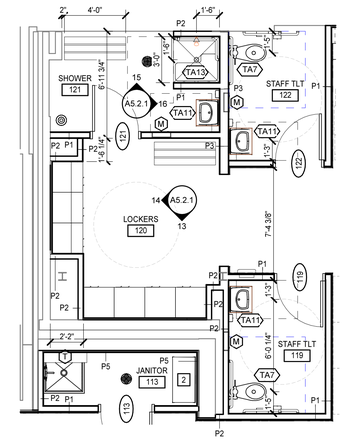
15 A1.1.1 A5.2.1 29 **SHOWER 121 NORTH**
1/4" = 1'-0"

14 A1.1.1 A5.2.1 28 **LOCKERS 120 WEST**
1/4" = 1'-0"

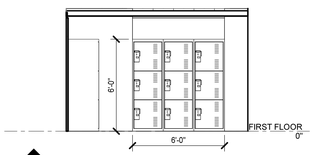
13 A1.1.1 A5.2.1 27 **LOCKERS 120 SOUTH**
1/4" = 1'-0"



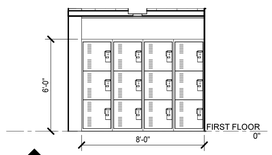
12 A1.1.1 A5.2.1 **ENLARGED PLAN EVIDENCE SUITE**
1/4" = 1'-0"



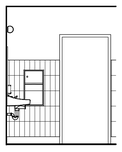
11 A1.1.1 A5.2.1 24 **ENLARGED PLAN**
1/4" = 1'-0"



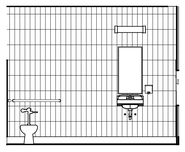
14 A1.1.1 A5.2.1 28 **LOCKERS 120 WEST**
1/4" = 1'-0"



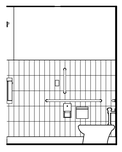
13 A1.1.1 A5.2.1 27 **LOCKERS 120 SOUTH**
1/4" = 1'-0"



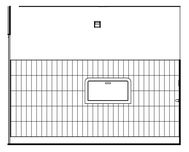
10 TYP A5.2.1 **TYPICAL TOILET, SINK SIDE WALL**
1/4" = 1'-0"



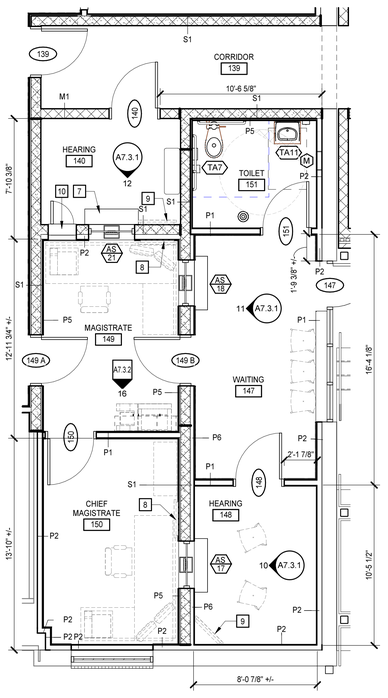
9 TYP A5.2.1 **TYPICAL TOILET WALL, OPPOSITE OF TOILET AND SINK**
1/4" = 1'-0"



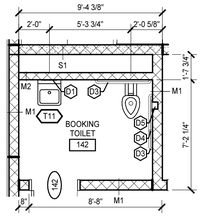
8 TYP A5.2.1 **TYPICAL TOILET, TOILET SIDE WALL**
1/4" = 1'-0"



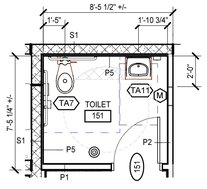
7 TYP A5.2.1 **TYPICAL TOILET, TOILET AND SINK WALL**
1/4" = 1'-0"



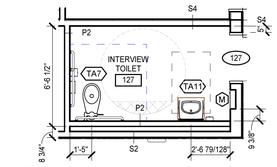
1 A1.1.1 A5.2.1 **ENLARGED PLAN MAGISTRATE SUITE**
1/4" = 1'-0"



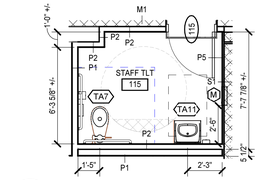
6 A1.1.1 A5.2.1 26 **ENLARGED PLAN**
1/4" = 1'-0"



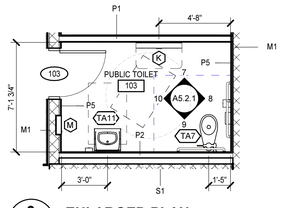
5 A1.1.1 A5.2.1 23 **ENLARGED PLAN**
1/4" = 1'-0"



4 A1.1.1 A5.2.1 22 **ENLARGED PLAN**
1/4" = 1'-0"



3 A1.1.1 A5.2.1 21 **ENLARGED PLAN**
1/4" = 1'-0"



2 A1.1.1 A5.2.1 20 **ENLARGED PLAN**
1/4" = 1'-0"

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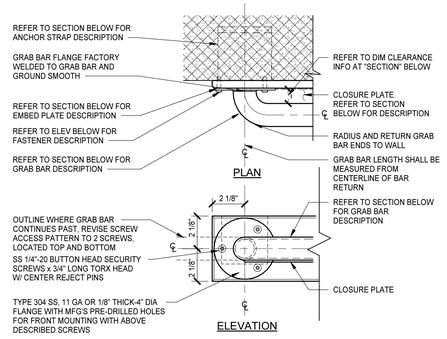
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

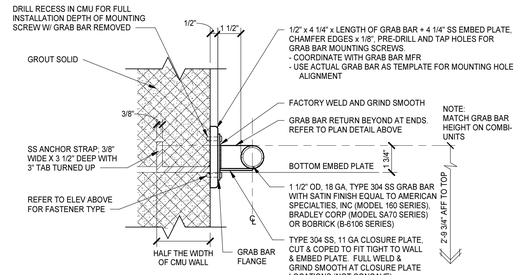
ENLARGED PLANS, ELEVATIONS, AND DETAILS

A5.2.1

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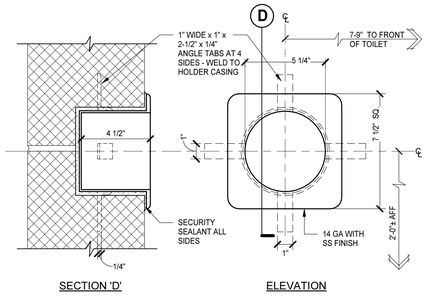


NOTE:
GRAB BARS FURNISHED UNDER DIVISION 11 AND INSTALLED UNDER DIVISION 4. SET GRAB BARS WITH EMBED PLATES ATTACHED. PROTECT UNIT UNTIL MASONRY MORTAR HAS CURED FOR FIRM ANCHORAGE.

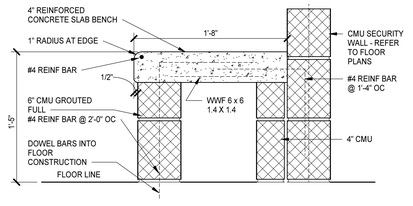


3 A5.3.1 REMOVABLE GRAB BAR W/ CONTINUOUS EMBED PLATE DETAIL
3" = 1'-0"

2 A5.3.1 DETENTION MIRROR, SINGLE
1 1/2" = 1'-0"



4 A5.3.1 RECESSED TOILET PAPER ROLL HOLDER
3" = 1'-0"



1 A5.3.1 CONCRETE DETENTION BENCH
1 1/2" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
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MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
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ARCHITECT

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DATE	DESCRIPTION

DETENTION EQUIPMENT DETAILS

A5.3.1

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DOOR SCHEDULE

NUMBER	DOOR TYPE	SIZE (NOMINAL)	DOOR MATL	DOOR LOUVER	DOOR UC	DOOR GLAZING TYPE	FRAME TYPE	FRAME NUMBER	FRAME SECTIONS	FRAME HEAD DETAIL	FRAME JAMB DETAIL	FRAME JAMB DETAIL	FRAME SILL DETAIL	HDWR	FIRE RATING (MINS)	NOTES
100 A	FG	3'-0" x 7'-0" x 2"	ALUM	--		2	AS	1	--	11/A6.2.1	12/A6.2.1	12/A6.2.1	--	ALD-01	--	2
100 B	FG	3'-0" x 7'-0" x 2"	ALUM	--		1	AS	12	--	35/A6.2.2	--	--	--	ALD-02	--	2
101 A	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	01	--	
101 B	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	02	--	4
102 A	F	PR 3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	03	--	
102 B	F	3'-0" x 7'-0" x 1 3/4"	STL	--		--	STL	1	A	49/A6.2.3	50/A6.2.3	50/A6.2.3	--	04	--	2
103	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	05	--	
104	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	06	--	2
105	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	07	--	2, 4
106	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	08	--	
108	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	09	--	
109	N2	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	10	--	
110	F	3'-0" x 6'-8" x 1 3/4"	STL	--		--	STL	1	A	56/A6.2.4	56/A6.2.1	56/A6.2.1	--	04	--	2
112	F	3'-0" x 6'-8" x 1 3/4"	STL	--		--	STL			51/A6.2.3	69/A6.2.4	51/A6.2.4	51/A6.2.3		--	
113	F	3'-4" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	12	--	
114	F	2'-8" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	13	--	
115	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	14	--	
116 A	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	15	--	2
116 B	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	16	--	2
116 C	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	17	--	
117	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	18	--	2
118	G	3'-0" x 7'-0" x 1 3/4"	STL	--		5	STL	1	A	54/A6.2.4	55/A6.2.1	55/A6.2.1	--	04	--	2
119	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	14	--	
121	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	19	--	
122	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	14	--	
123	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	20	--	
124	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	21	--	
126	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	53/A6.2.3	53/A6.2.3	53/A6.2.3	--	22	--	
127	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	53/A6.2.3	53/A6.2.3	53/A6.2.3	--	23	--	
128 A	F	3'-0" x 7'-0" x 1 3/4"	ALUM	--		--	STL	1	A	56/A6.2.4	56/A6.2.1	56/A6.2.1	--	ALD-03	--	2, 4
128 B	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	24	--	
129	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	06	--	2
130 A	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	06	--	2
130 B	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	25	--	2
131	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	21	--	
132	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	21	--	
134	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	26	--	
135	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	21	--	
136	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	21	--	
138	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	27	--	2
139	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	28	--	2
140	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	29	--	
141	F	3'-0" x 7'-0" x 1 3/4"	STL	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	30	--	3
142	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	31	--	
143	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	07	--	2
145 A	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	57/A6.2.4	57/A6.2.4	57/A6.2.4	--	18	--	2
145 B	F	PR 3'-0" x 7'-0" x 1 3/4"	STL	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	32	--	2
146 C	F	3'-0" x 7'-0" x 1 3/4"	STL	--		--	STL	1	A	54/A6.2.3	55/A6.2.3	55/A6.2.3	--	34	--	3
147	FG	2'-10" x 7'-0" x 2"	ALUM	--		2	AS	6	--	11/A6.2.1	12/A6.2.1	12/A6.2.1	67/A6.2.4	ALD-04	--	1,2
148	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	29	--	
149 A	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	35	--	
149 B	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	51/A6.2.3	51/A6.2.3	51/A6.2.3	--	36	--	2, 4
150	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	21	--	
151	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	05	--	
152	F	3'-0" x 7'-0" x 1 3/4"	STL	--		--	STL	1	A	54/A6.2.3	55/A6.2.3	55/A6.2.3	--	37	--	
201	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	16	--	2
202	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	14	--	
203	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	38	--	
204	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	39	--	
205	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	40	--	
206	F	3'-0" x 7'-0" x 1 3/4"	WD	--		--	STL	1	A	1/A6.2.1	1/A6.2.1	1/A6.2.1	--	41	--	
207	F	3'-0" x 7'-0" x 1 3/4"	STL	--		--	STL	1	A	59/A6.2.4	57/A6.2.4	57/A6.2.4	--	42	--	
208	F	3'-0" x 5'-0" x 2"	STL	--		--	STL	3	A	68/A6.2.4	68/A6.2.4	68/A6.2.4	--	43	--	

NOTE:

1. PAXON VIDEO INTERCOM, NIC
2. CARD READER, ONE SIDE
3. CARD READER, BOTH SIDES
4. BULLET RESISTANT DOOR AND FRAME, LEVEL 3

GENERAL NOTES

A. UNLESS INDICATED OTHERWISE, ALL DETAIL NUMBERS IN THE DOOR AND FRAME SCHEDULE FOR HEAD, JAMB AND SILL CONDITIONS REFER TO DRAWINGS A6.2.1 - A6.2.X.

B. DOOR AND FRAME DETAILS INDICATE GENERAL CHARACTERISTICS OF DOOR AND FRAME SIZES AND COMPONENTS AND MAY NOT INDICATE EXACT FIELD CONDITIONS OR REQUIREMENTS. COORDINATE DETAILS WITH OTHER DRAWINGS AND SPECS TO DETERMINE ALL COMPONENTS (E.G., SEALANTS, ANCHORS, HARDWARE, LINTELS, CLIPS) REQUIRED FOR COMPLETE AND FUNCTIONAL INSTALLATION.

C. DOOR SWINGS ON FLOOR PLANS TAKE PRECEDENCE OVER SWINGS INDICATED ELSEWHERE (E.G., ELEVATIONS).

Moseley
3200 NORFOLK STREET. RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

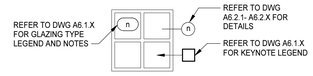
REVISIONS
DATE DESCRIPTION

DOOR AND FRAME SCHEDULE

A6.1.1

11/2/2026 1:03:49 PM

GENERAL NOTES



GLAZING TYPES

REPRESENTED BY n

1. 1/4" CLEAR
2. 1" TINTED INSULATING
3. 1" SPANDREL PANEL
4. 1" BLUE SPANDREL PANEL
5. BULLET RESISTANT - LEVEL 3
6. DOUBLE SIDED 1" BLUE SPANDREL PANEL

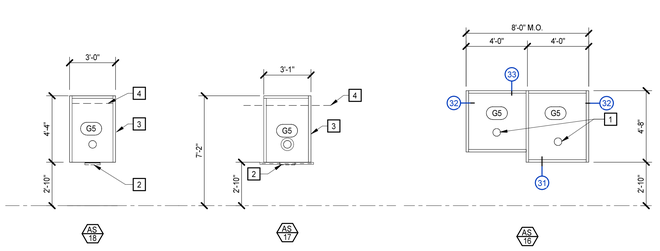
NOTES:
1. ALL GLAZING IN INTERIOR FRAMES SHALL BE TYPE 1, UNO
2. ALL GLAZING IN EXTERIOR FRAMES SHALL BE TYPE 2, UNO
3. GLAZE ALL OPENINGS IN FRAMES UNLESS SPECIFICALLY INDICATED OTHERWISE
4. ALL GLAZING SHALL BE SAFETY GLASS UNLESS INDICATED OTHERWISE

DOOR, FRAME AND GLAZING TYPE KEYNOTES

REPRESENTED BY n

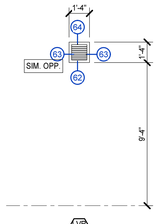
APPLIES TO DRAWINGS A6.1.1 - A6.1.X

1	BULLET-RESISTANT AMPLIFIED SPEAK-THRU SPEAKER UNIT
2	BULLET-RESISTANT RECESSED DEAL TRAY
3	BULLET-RESISTANT ALUM.
4	MANUAL SHEER ROLLER SHADE, ATTACH TO GYP WITHIN HEAD DETAIL
5	OPAQUE FILM
6	AUTOMATIC SHEER ROLLER SHADE, ATTACH TO GYP WITHIN HEAD DETAIL



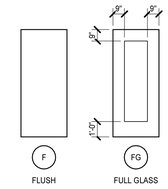
SECURITY WINDOW DETAILS

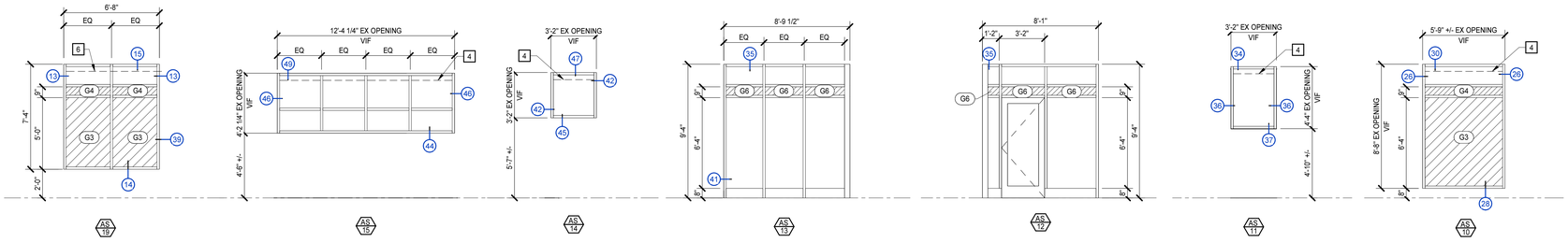
1/4" = 1'-0"

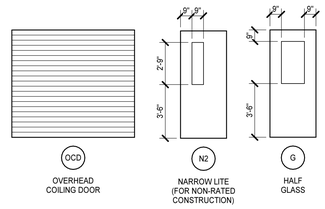


LOUVER TYPES

1/4" = 1'-0"

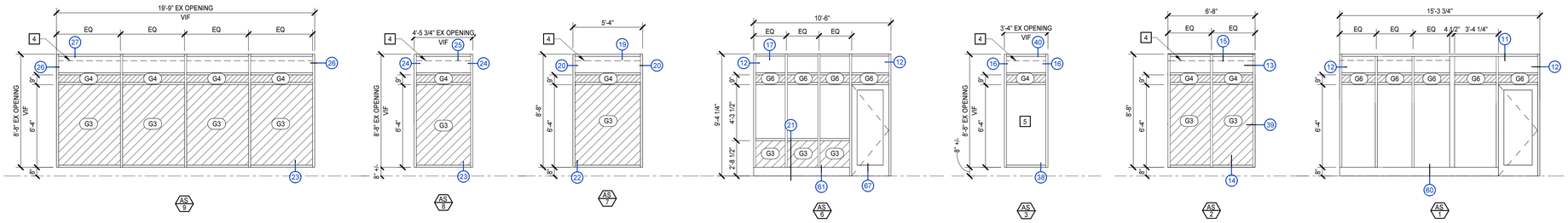






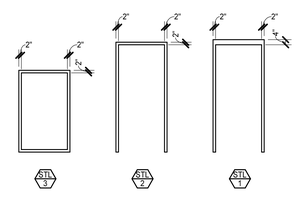
DOOR TYPES

NO SCALE



ALUMINUM STOREFONT SYSTEMS

1/4" = 1'-0"



DOOR FRAME TYPES

1/4" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
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PROJECT NO: 651033 DATE: OCTOBER 21, 2026

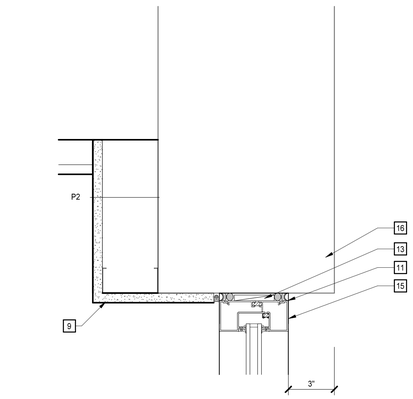
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

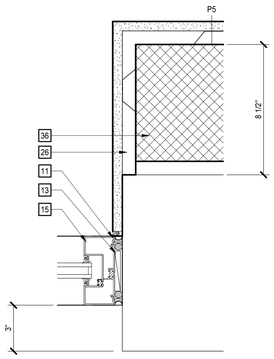
DOOR, FRAME AND GLAZING TYPES

A6.1.2

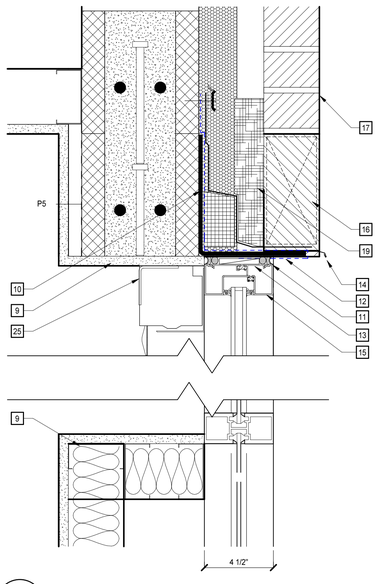
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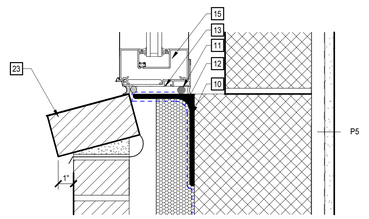
17 HEAD DETAIL
A3.1.3 | A6.2.1 — 3" = 1'-0"



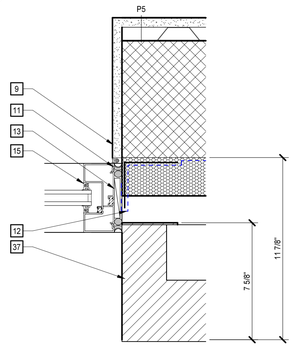
16 JAMB DETAIL
A6.1.2 | A6.2.1 — 3" = 1'-0"



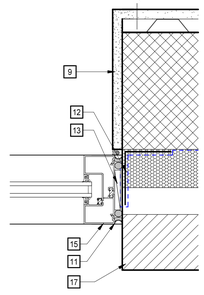
15 HEAD DETAIL
A3.1.2 | A6.2.1 — 3" = 1'-0"



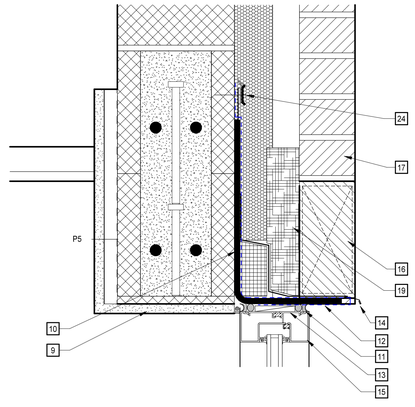
14 SILL DETAIL
A3.1.1 | A6.2.1 — 3" = 1'-0"



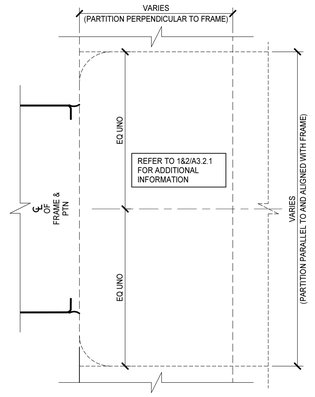
13 JAMB DETAIL
A6.1.2 | A6.2.1 — 3" = 1'-0"



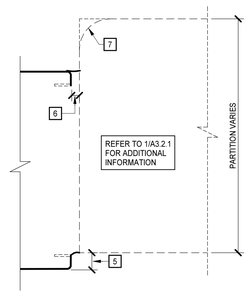
12 JAMB DETAIL
A6.1.2 | A6.2.1 — 3" = 1'-0"



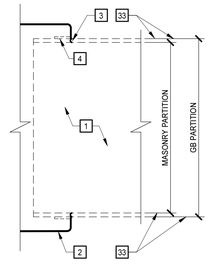
11 HEAD DETAIL
A3.1.1 | A6.2.1 — 3" = 1'-0"



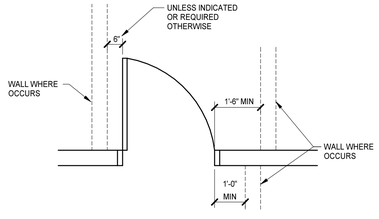
3 INTERIOR BETWEEN THE JAMB - BUTTED HEAD/JAMB/SILL
A6.2.1 — 6" = 1'-0"



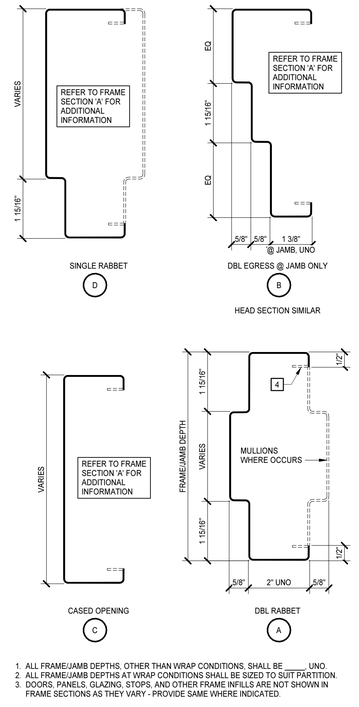
2 INTERIOR BETWEEN THE JAMB - PROJECTED HEAD/JAMB/SILL
A6.2.1 — 6" = 1'-0"



1 INTERIOR WRAP HEAD/JAMB/SILL
A6.2.1 — 6" = 1'-0"



MANEUVERING CLEARANCE AT DOORS
NO SCALE



STEEL FRAME SECTIONS
NO SCALE

1. ALL FRAME/JAMB DEPTHS, OTHER THAN WRAP CONDITIONS, SHALL BE _____ UNO.
2. ALL FRAME/JAMB DEPTHS AT WRAP CONDITIONS SHALL BE SIZED TO SUIT PARTITION.
3. DOORS, PANELS, GLAZING, STOPS, AND OTHER FRAME INFILLS ARE NOT SHOWN IN FRAME SECTIONS AS THEY VARY - PROVIDE SAME WHERE INDICATED.

DOOR AND FRAME DETAIL KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A6.2.1 - A6.2.X

1	ANCHORAGES, REINFORCING, SPECIFIC PARTITION CONSTRUCTION AND/OR LINTELS ARE NOT SHOWN FOR CLARITY.
2	REFER TO FRAME SECTION IN DOOR SCHEDULE FOR TYPE.
3	SEALANT, ALL SIDES - TOOL TO 90°.
4	BACKBEND RETURN @ GB LOCATIONS ONLY.
5	9/16" @ MAS; 1/2" @ GB.
6	1/4" @ JAMBS, UNO; DIMENSION @ HEAD & SILL VARIES.
7	BULLNOSE @ CMU JAMBS & SILLS.
8	CAST STONE COPING, SHAPE 1
9	5/8" GYP BD
10	ANGLE. REFER TO STRUCTURAL DRAWINGS. PAINT AT EXPOSED HEAD CONDITIONS
11	BACKER ROD & SEALANT
12	AIR BARRIER MEMBRANE
13	PPT WOOD SHIM
14	SEAL EMBEDDED FLEXIBLE FLASHING TO METAL DRIP EDGE
15	ALUMINUM STOREFRONT SYSTEM
16	BRICK SOILDER COURSE
17	BRICK VENEER, REFER TO WALL ASSEMBLY TYPES ON A0.1.3
18	INTERIOR BUILDING EXPANSION JOINT COVER
19	CAVITY DRAINAGE MATERIAL
20	PARTITION TYPE VARIES, REFER TO PLAN
21	CFSF ANGLE
22	3 5/8" CFSF-NS
23	BRICK ROWLOCK W/ WEEP, DRIP EDGE, & GROUT INFILL
24	CONTINUOUS TERMINATION BAR & SEALANT
25	BLACKOUT ROLLER SHADE
26	INTERIOR FURRING CHANNEL
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28	SOLID SURFACE SILL
29	MCM WALL PANELS
30	EX LINTEL
31	ALUMINUM LOUVER
32	METAL FLASHING W/ DRIP EDGE
33	0" @ GB LOCATIONS; 1/16" @ MAS LOCATIONS.
34	PAINT PLATE, REFER TO STRUCTURAL
35	1/2" FILLER STRIP, REFER TO STRUCTURAL DRAWINGS.
36	BEARING WALL, REFER TO STRUCTURAL DRAWINGS
37	BRICK COURSING, REFER TO DTL 11/A1.4.1.

Moseley
3200 NORFOLK STREET. RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

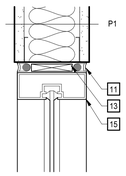
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS
DATE DESCRIPTION

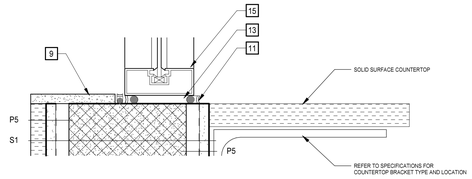
DOOR AND FRAME DETAILS

A6.2.1

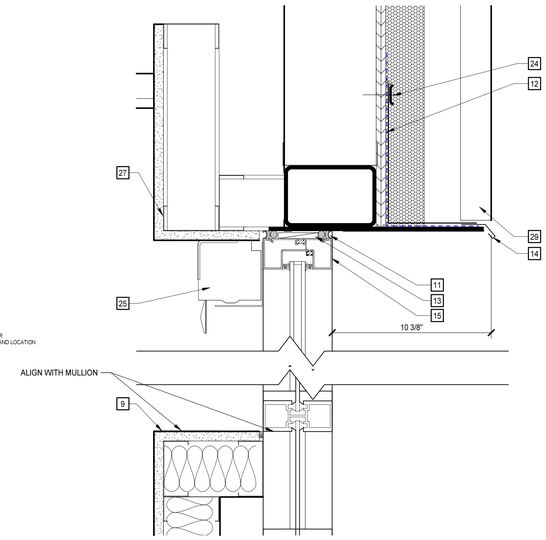
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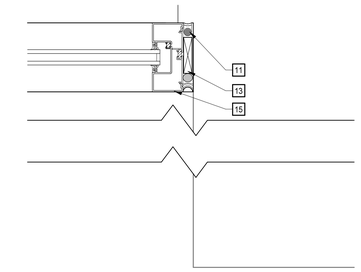
35 HEAD DETAIL
A6.1.2 A6.2.2 3" = 1'-0"



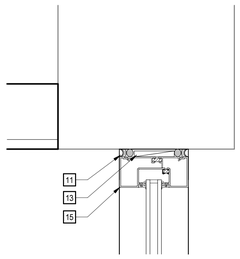
31 SILL DETAIL
A6.1.2 A6.2.2 3" = 1'-0"



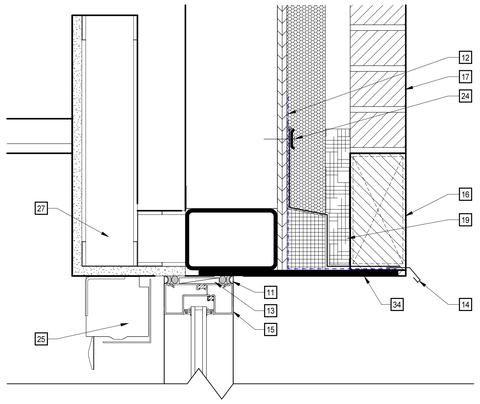
27 HEAD DETAIL
A3.1.2 A6.2.2 3" = 1'-0"

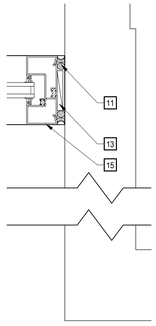


24 JAMB DETAIL
A6.1.2 A6.2.2 3" = 1'-0"

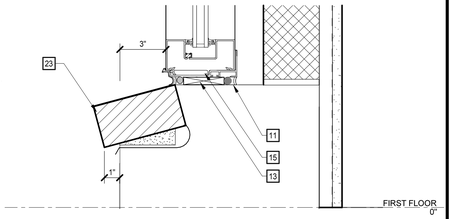


34 HEAD DETAIL
A6.1.2 A6.2.2 3" = 1'-0"

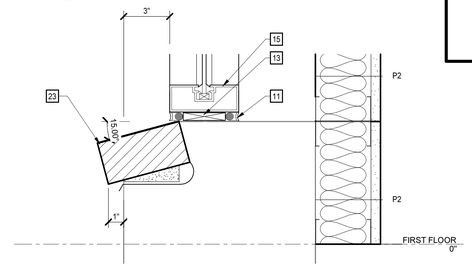




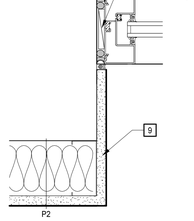
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A6.1.2 A6.2.2 3" = 1'-0"



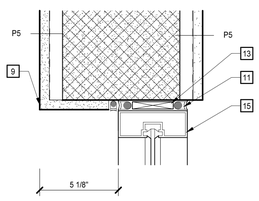
23 SILL DETAIL
A6.1.2 A6.2.2 3" = 1'-0"



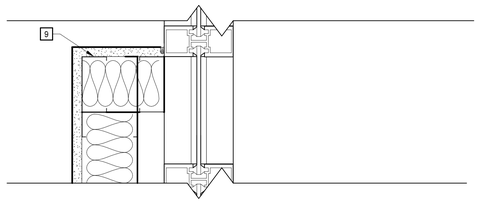
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A6.1.2 A6.2.2 3" = 1'-0"



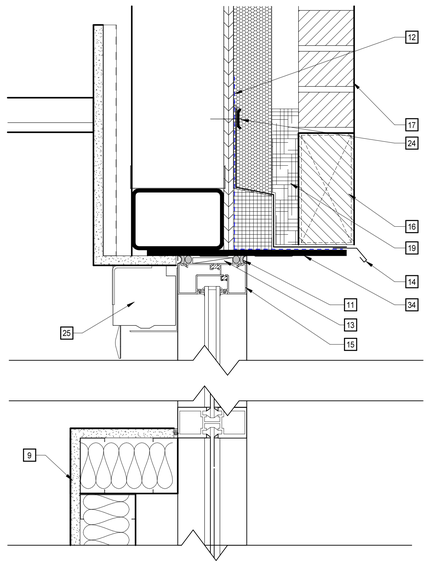
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A6.1.2 A6.2.2 3" = 1'-0"



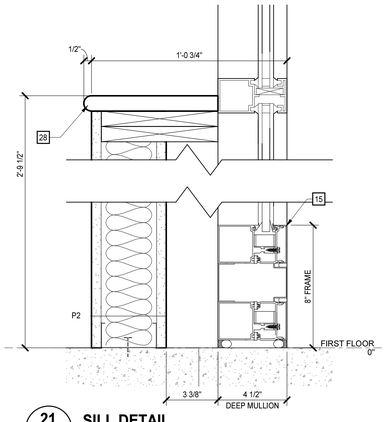
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A6.1.2 A6.2.2 3" = 1'-0"



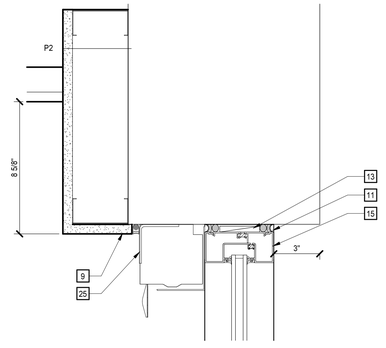
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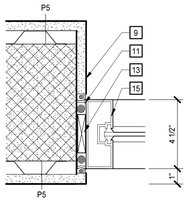
25 HEAD DETAIL
A3.1.1 A6.2.2 3" = 1'-0"



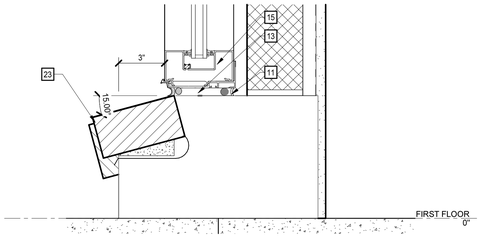
21 SILL DETAIL
A3.1.3 A6.2.2 3" = 1'-0"



19 HEAD DETAIL
A6.1.2 A6.2.2 3" = 1'-0"



32 JAMB DETAIL
A6.1.2 A6.2.2 3" = 1'-0"



28 SILL DETAIL
A3.1.3 A6.2.2 3" = 1'-0"

DOOR AND FRAME DETAIL KEYNOTES

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Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
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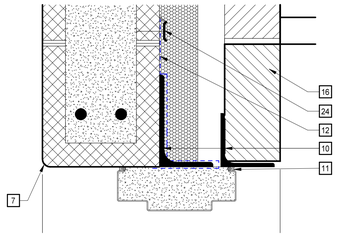
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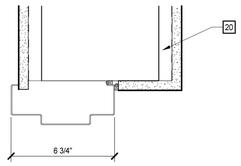
DOOR AND FRAME DETAILS

A6.2.2

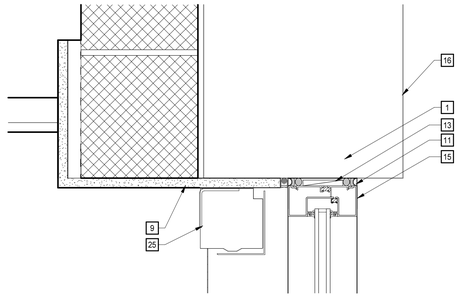
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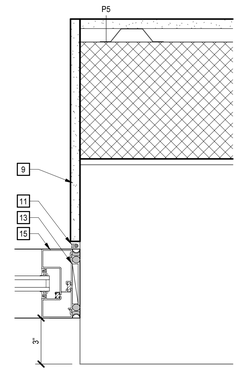
54 G4.1.1 | A6.2.3 **HEAD DETAIL** 3" = 1'-0"



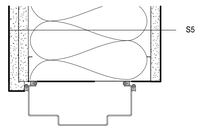
50 A6.2.3 **HEAD/JAMB DETAIL** 3" = 1'-0"



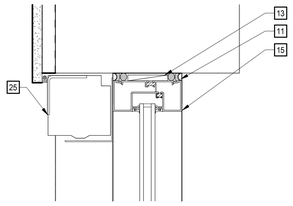
47 A6.1.2 | A6.2.3 **HEAD DETAIL** 3" = 1'-0"



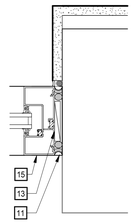
42 A6.1.2 | A6.2.3 **JAMB DETAIL** 3" = 1'-0"



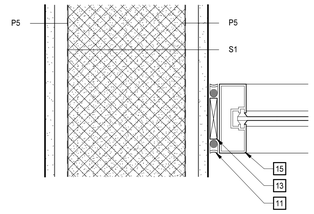
53 A6.2.3 **HEAD/JAMB DETAIL** 3" = 1'-0"



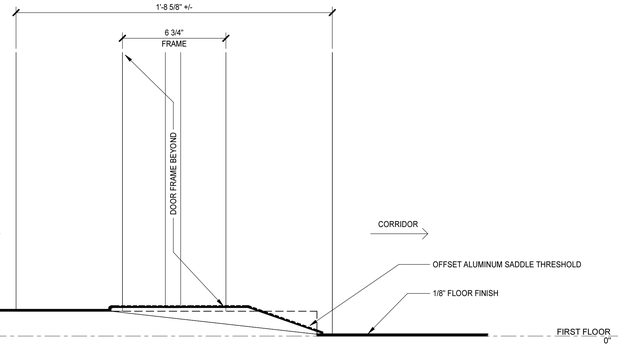
49 A6.1.2 | A6.2.3 **HEAD DETAIL** 3" = 1'-0"



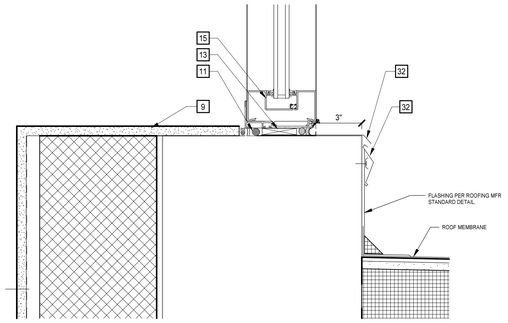
46 A6.1.2 | A6.2.3 **JAMB DETAIL** 3" = 1'-0"



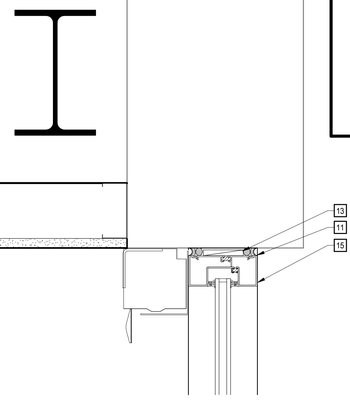
41 A6.1.2 | A6.2.3 **JAMB DETAIL** 3" = 1'-0"



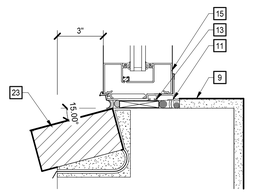
51 A6.2.3 **SILL DETAIL** 3" = 1'-0"



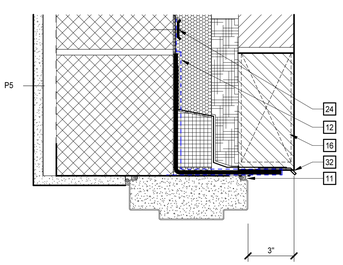
45 A6.1.2 | A6.2.3 **SILL DETAIL** 3" = 1'-0"



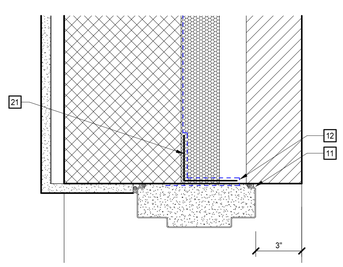
40 A6.1.2 | A6.2.3 **HEAD DETAIL** 3" = 1'-0"



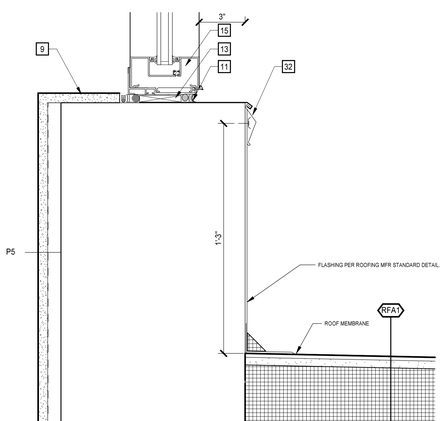
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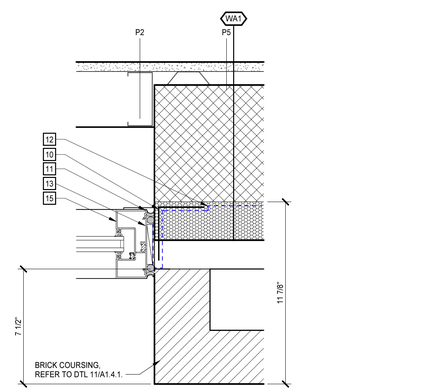
52 A7.2.1 | A6.2.3 **HEAD DETAIL** 3" = 1'-0"



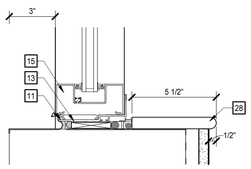
48 A6.2.3 **JAMB DETAIL** 3" = 1'-0"



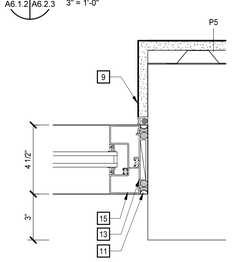
44 A6.1.2 | A6.2.3 **SILL DETAIL** 3" = 1'-0"



39 A6.1.2 | A6.2.3 **JAMB DETAIL** 3" = 1'-0"



37 A6.1.2 | A6.2.3 **SILL DETAIL** 3" = 1'-0"



36 A6.1.2 | A6.2.3 **JAMB DETAIL** 3" = 1'-0"

DOOR AND FRAME DETAIL KEYNOTES

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111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS
DATE DESCRIPTION

DOOR AND FRAME DETAILS

A6.2.3

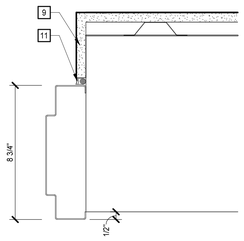
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DOOR AND FRAME DETAIL KEYNOTES

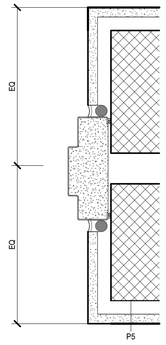
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APPLIES TO DRAWINGS A6.2.1 - A6.2.X

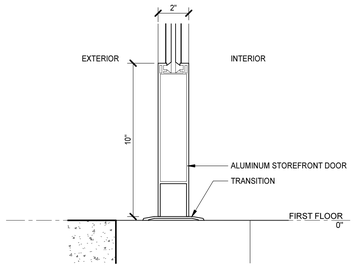
1	ANCHORAGES, REINFORCING, SPECIFIC PARTITION CONSTRUCTION AND/OR LINTELS ARE NOT SHOWN FOR CLARITY.
2	REFER TO FRAME SECTION IN DOOR SCHEDULE FOR TYPE.
3	SEALANT, ALL SIDES - TOOL TO 90°.
4	BACKBEND RETURN @ GB LOCATIONS ONLY.
5	9/16" @ MAS, 1/2" @ GB.
6	1/4" @ JAMBS, UNO; DIMENSION @ HEAD & SILL VARIES.
7	BULLNOSE @ CMU JAMBS & SILLS.
8	CAST STONE COPING, SHAPE 1
9	5/8" GYP BD
10	ANGLE, REFER TO STRUCTURAL DRAWINGS. PAINT AT EXPOSED HEAD CONDITIONS
11	BACKER ROD & SEALANT
12	AIR BARRIER MEMBRANE
13	PPT WOOD SHIM
14	SEAL EMBEDDED FLEXIBLE FLASHING TO METAL DRIP EDGE
15	ALUMINUM STOREFRONT SYSTEM
16	BRICK SOILDER COURSE
17	BRICK VENEER, REFER TO WALL ASSEMBLY TYPES ON A0.1.3
18	INTERIOR BUILDING EXPANSION JOINT COVER
19	CAVITY DRAINAGE MATERIAL
20	PARTITION TYPE VARIES, REFER TO PLAN
21	CFSF ANGLE
22	3 5/8" CFSF-NS
23	BRICK ROWLOCK W/ WEEP, DRIP EDGE, & GROUT INFILL
24	CONTINUOUS TERMINATION BAR & SEALANT
25	BLACKOUT ROLLER SHADE
26	INTERIOR FURRING CHANNEL
27	CFSF
28	SOLID SURFACE SILL
29	MCM WALL PANELS
30	EX LINTEL
31	ALUMINUM LOUVER
32	METAL FLASHING W/ DRIP EDGE
33	0" @ GB LOCATIONS; 1/16" @ MAS LOCATIONS.
34	PAINT PLATE, REFER TO STRUCTURAL
35	1/2" FILLER STRIP, REFER TO STRUCTURAL DRAWINGS.
36	BEARING WALL, REFER TO STRUCTURAL DRAWINGS
37	BRICK COURSING, REFER TO DTL 11/A1.4.1.



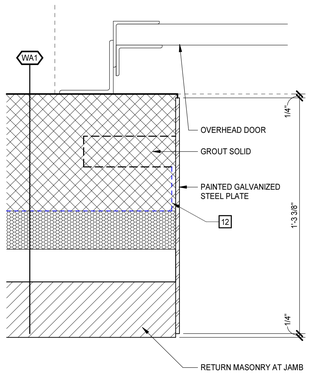
68 JAMB/HEAD DETAIL A6.2.4 — 3" = 1'-0"



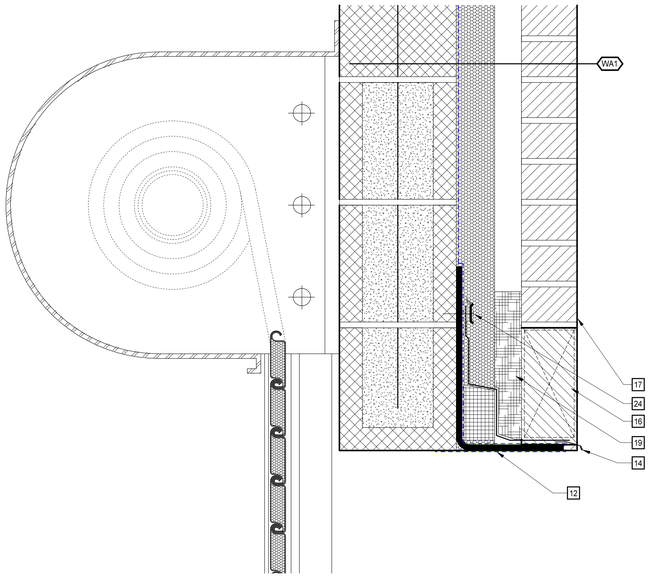
69 JAMB/HEAD DETAIL A6.2.4 — 3" = 1'-0"



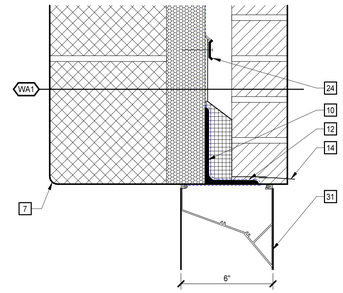
67 STOREFRONT - SILL DETAIL A0.2.2 | A6.2.4 — 3" = 1'-0"



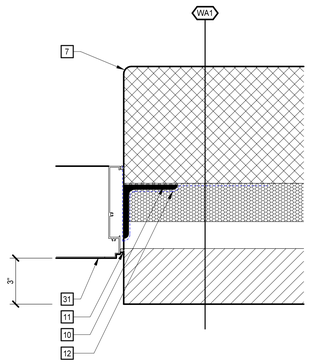
66 HEAD DETAIL A6.2.4 — 3" = 1'-0"



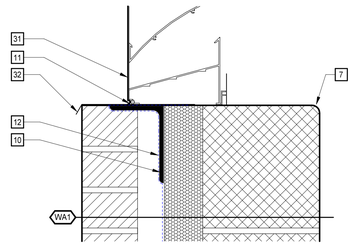
65 HEAD DETAIL A1.3.1 | A6.2.4 — 3" = 1'-0"



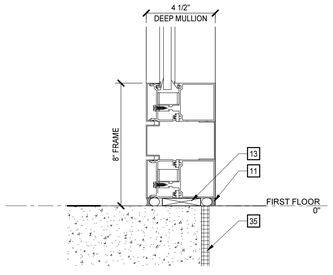
64 HEAD DETAIL A6.1.2 | A6.2.4 — 3" = 1'-0"



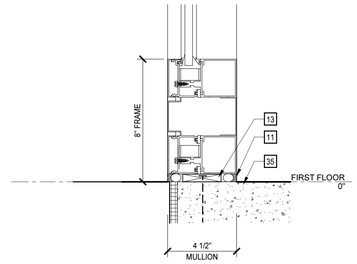
63 JAMB DETAIL A6.1.2 | A6.2.4 — 3" = 1'-0"



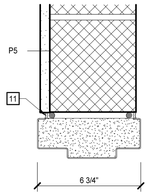
62 SILL DETAIL A6.1.2 | A6.2.4 — 3" = 1'-0"



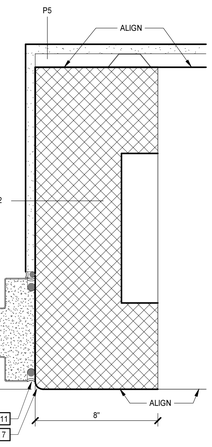
61 SILL DETAIL A0.2.2 | A6.2.4 — 3" = 1'-0"



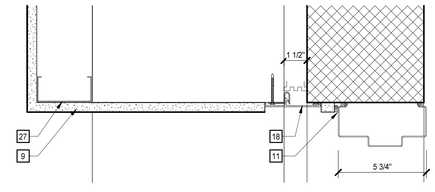
60 SILL DETAIL A3.1.1 | A6.2.4 — 3" = 1'-0"



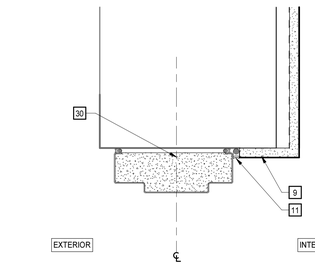
59 HEAD DETAIL A6.2.4 — 3" = 1'-0"



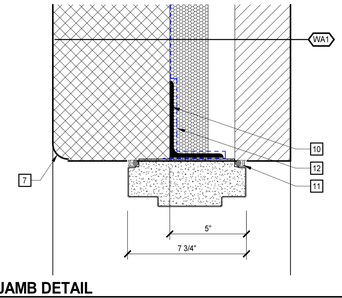
58 JAMB DETAIL A6.2.4 — 3" = 1'-0"



57 HEAD/JAMB DETAIL A6.2.4 — 3" = 1'-0"



56 HEAD/JAMB DETAIL A6.2.4 — 3" = 1'-0"



55 JAMB DETAIL A6.2.4 — 3" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026

SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

DOOR AND FRAME DETAILS

A6.2.4

11/2/2026 1:04:07 PM

DETENTION DOOR SCHEDULE

NUMBER	HDWR SET NO.	DOOR TYPE	SIZE (NOMINAL)	DOOR MATL	DOOR SECURITY GLAZING TYPE	FRAME TYPE	FRAME NUMBER	FRAME HEAD DETAIL	FRAME JAMB DETAIL	FRAME JAMB DETAIL	FRAME SILL DETAIL	KEYING SECURITY	KEYING MASTER	FIRE RATING (MINS)	OPTIONS SHUTTER	OPTIONS FOOD PASS	NOTES
146 B	33	OCD	12'-0"x10'-0"x2"			STL	1	65/A6.2.4	66/A6.2.4	66/A6.2.4	--						
146 A	33	OCD	12'-0"x10'-0"x2"			STL	1	65/A6.2.4	66/A6.2.4	66/A6.2.4	--						
D144	SH10	DG	3'-0"x7'-0"x2"	DHM	SG-2P	DHM	1					P1		--			KEYED LOCK

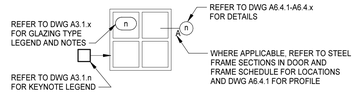
GENERAL NOTES

A. UNLESS INDICATED OTHERWISE, ALL DETAIL NUMBERS IN THE DOOR AND FRAME SCHEDULE FOR HEAD, JAMB AND SILL CONDITIONS REFER TO DRAWINGS A6.4.1 - A6.4.X.

B. DOOR AND FRAME DETAILS INDICATE GENERAL CHARACTERISTICS OF DOOR AND FRAME SIZES AND COMPONENTS AND MAY NOT INDICATE EXACT FIELD CONDITIONS OR REQUIREMENTS. COORDINATE DETAILS WITH OTHER DRAWINGS AND SPECS TO DETERMINE ALL COMPONENTS (E.G., SEALANTS, ANCHORS, HARDWARE, LINTELS, CLIPS) REQUIRED FOR COMPLETE AND FUNCTIONAL INSTALLATION.

C. DOOR SWINGS ON FLOOR PLANS TAKE PRECEDENCE OVER SWINGS INDICATED ELSEWHERE (E.G., ELEVATIONS).

DETENTION DOOR, FRAME AND GLAZING TYPE GENERAL NOTES



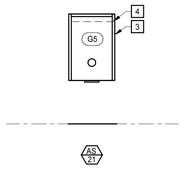
A. NOTE 1...

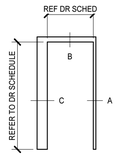
B. NOTE 2...

DETENTION GLAZING TYPES

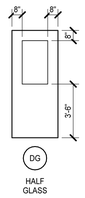
SG-1P = 3/4" ± THICK MULTI-PLY POLYCARBONATE GLAZING; ASTM F1915 GRADE 1

SG-2P = 1/2" ± THICK MULTI-PLY POLYCARBONATE GLAZING; ASTM F1915 GRADE 2

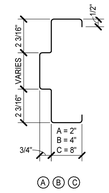




DHM1



HALF GLASS



DETENTION FRAME TYPES

DETENTION DOOR TYPES

DETENTION FRAME SECTIONS

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
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PROJECT NO: 651033 DATE: OCTOBER 21, 2026
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DATE DESCRIPTION

DETENTION DOOR SCHEDULE, FRAME AND GLAZING TYPES

A6.3.1

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FINISH SCHEDULE

NUMBER	NAME	FLOOR	BASE	WALLS				WAINSCOT	CEILING	NOTES
				NORTH	EAST	SOUTH	WEST			
100	VESTIBULE	C-TILE-B	RB-B	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
101	WAITING/ LOBBY	P-TILE	P-TILE	PT-1 / PT-4 / IRWC-1 / IRWC-2	PT-1 / IRWC-2	PT-1 / IRWC-2	PT-1 / IRWC-2	-	ACP-A	4
102	COMMUNITY ROOM	C-TILE-A	RB-A	PT-1	PT-1	PT-1	PT-1	-	GB PT-3, ACP-A	2
102A	COMM STOR	C-TILE-A	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
103	PUBLIC TOILET	P-TILE	P-TILE	PT-1	PT-1	GWT	PT-1	GWT @ 66"	GB EPX PT-3	
104	RECEPTION	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
105	CORRIDOR	RST	RB-B	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	4
106	WELLNESS	TCF	RB-A	PT-1	PT-1	PT-1	GWT/PT-1	-	ACP-A	
107	KITCHEN/ BREAK	RST	RB-B	GWT / PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	GWT / PT-1/ IRWC-1	-	ACP-A	
108	CONFERENCE	C-TILE-A	RB-A	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	GB PT-3, ACP-A	3
110	CORRIDOR	RST	RB-B	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	4
111	CORRIDOR	RST	RB-B	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	4
112	GUN STORAGE	CONC-SLR, EPX PT	RB-A	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	GB EPX PT-3	
113	JANITOR	P-TILE	P-TILE	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	GB EPX PT-3	
114	EVIDENCE SUPPLY	CONC-SLR	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
115	STAFF TLT	P-TILE	P-TILE	PT-1	PT-1	GWT	PT-1	GWT @ 66"	GB EPX PT-3	
116	EVIDENCE PROCESSING	RES	RES	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	ACP-A	6
116A	EVIDENCE STORAGE	RES	RES	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	ACP-A	
117	EVIDENCE HOLDING	RES	RES	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	ACP-A	
118	REPORT WRITING	TCF	RB-B	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	
119	STAFF TLT	P-TILE	P-TILE	PT-1	PT-1	GWT	PT-1	GWT @ 66"	GB EPX PT-3	
120	LOCKERS	P-TILE	P-TILE	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	GB EPX PT-3	
121	SHOWER	P-TILE	P-TILE	PT-1	GWT	PT-1	PT-1	GWT @ 66"	GB EPX PT-3	
122	STAFF TLT	P-TILE	P-TILE	PT-1	PT-1	PT-1	GWT	GWT @ 66"	GB EPX PT-3	
123	SERGEANTS	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
124	LIEUTENANT	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
125	CORRIDOR	RST	RB-B	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	4
126	INTERVIEW	TCF	RB-A	AWC/PT-1	AWC/PT-1	AWC/PT-1	AWC/PT-1	-	GB-S PT-3	7
127	INTERVIEW TOILET	P-TILE	P-TILE-A	PT-1	PT-1	GWT	PT-1	GWT @ 66"	GB-SP PT-3	
128	EXIT VESTIBULE	C-TILE-B	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
129	SECURE DATA	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
130	INVESTIGATORS, INVESTIGATIONS ADMIN ASSISTANT	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
130A	FILES/PRINT	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
131	LIEUTENANT	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
132	DEPUTY CHIEF	TCF	RB-A	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	3
133	CORRIDOR	RST	RB-B	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	4
134	POLICE ADMIN	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
135	ACCREDIDATION MANAGER	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
136	POLICE CHIEF	TCF	RB-A	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	3
137	COPY	RST	RB-B	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	4
138	REPORT TAKING	C-TILE-A	RB-A	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	3
139	CORRIDOR	RES	RES	PT-1	PT-1	PT-1	PT-1	-	SC-PNL	
140	HEARING	RES	RES	PT-1	PT-1	PT-1	PT-1	-	SC-PNL	
141	PROCESSING / BOOKING	RES	RES	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	SC-PNL	
142	BOOKING TOILET	RES	RES	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	GB-S PT-3	
143	INTOXILIZER	RES	RES	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	GB-S PT-3	
144	HOLDING CELL	RES	RES	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	SC-PNL	
145	GENERAL STORAGE/ QUARTERMASTER	CONC-SLR, EPX PT	EPX	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	ACP-A	
145A	GUN CLEANING	CONC-SLR, EPX PT	EPX	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1		ACP-A	
146	SALLYPORT	CONC-SLR		EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	EXPC	
147	WAITING	P-TILE	P-TILE	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	4
148	HEARING	P-TILE	P-TILE	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
149	MAGISTRATE	TCF	RB-A	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	3
150	CHIEF MAGISTRATE	TCF	RB-A	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	PT-1 / IRWC-1	-	ACP-A	3
151	TOILET	P-TILE	P-TILE	GWT	PT-1	PT-1	PT-1	GWT @ 66"	GB EPX PT-3	
152	MECHANICAL	CONC-SLR, EPX PT	RB-A	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	EXPC	
201	DATA	RFT	RB-A	PT-1	PT-1	PT-1	PT-1	-	EXPC PT-3	
202	LAUNDRY	P-TILE	P-TILE	PT-1	PT-1	PT-1	PT-1	-	GB EPX PT-3	
203	TLT/SHOWER	P-TILE	P-TILE	PT-1	GWT	PT-1	PT-1	GWT @ 66"	GB EPX PT-3	
204	FUTURE GROWTH AREA	TCF	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
205	STORAGE	C-TILE-A	RB-A	PT-1	PT-1	PT-1	PT-1	-	ACP-A	
205	CORR	RST/RFT	RB-A	PT-1	PT-1	PT-1	PT-1		GB PT-3	
206	STORAGE	CONC-SLR	RB-A	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	ACP-A	5
207	ELECTRICAL	RFT	RB-A	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	EXPC	
S1	STAIR	RST/RFT	RB-A	EPX PT-1	EPX PT-1	EPX PT-1	EPX PT-1	-	GB EPX PT-1	1

INTERIOR FINISH LEGEND - BASIS OF DESIGN

REQUEST CLARIFICATION FROM THE ARCHITECT IN CASE OF A CONFLICT BETWEEN THE SPECIFICATIONS AND DRAWINGS OR IN CASE OF A CONFLICT BETWEEN A PRODUCT'S COLOR NAME AND NUMBER

SPECIFICATION	DESCRIPTION	MATERIAL	MANUFACTURER	PRODUCT - COLOR
064100 - ARCHITECTURAL WOODWORK AND CASEWORK				
	MISC-1	CABINET BACKING	CARNEGIE	STYLE: XOREL METEOR; COLOR: 6472W-2024
	PLAM-A	PLASTIC LAMINATE [WOODGRAIN]	WILSONART	COLOR: SHAKER CHERRY 7935
	PLAM-B	PLASTIC LAMINATE [SOLID]	WILSONART	COLOR: INDIGO D739
	QSM	QUARTZ SURFACING MATERIAL	CORIAN	COLOR: ESTATE QUARTZITE
	SS	STAINLESS STEEL	--	STAINLESS STEEL WITH SATIN FINISH
	SSM	SOLID SURFACE MATERIAL	CORIAN	COLOR: ARTISTA DRIFT
	WD	WOOD	LAMBTON DOORS	STAIN TO MATCH PLAM-A
093000 - TILING				
	GRT-A	GROUT [GWT-A / P-TILE]	MAPEI	CHARCOAL 5047
	GRT-B	GROUT [GWT-B]	MAPEI	AVALANCHE 5038
	GWT-1	GLAZED WALL TILE [ACCENT / BACKSPLASH	MOSAIC TILE	STYLE: COLOR PERSPECTIVES; SIZE: 4 X 12; COLOR: MARINE
	GWT-2	GLAZED WALL TILE	MOSAIC TILE	STYLE: COLOR PERSPECTIVES; SIZE: 4 X 12; COLOR: LIGHT
	P-TILE	PORCELAIN TILE	MOSAIC TILE	STYLE: ARGENT 2.0; SIZE: 12 X 12; COLOR: ON THE ROCKS
095100 - ACOUSTICAL CEILINGS				
	ACP-A	ACOUSTICAL CEILING PANEL	ARMSTRONG	STYLE: ULTIMA; COLOR: WHITE
	ACP-B	ACOUSTICAL CEILING PANEL [REPORT WRITING]	ARMSTRONG	STYLE: OPTIMA HEALTH ZONE PB; COLOR: WHITE
096513 - RESILIENT BASE AND ACCESSORIES				
	RB-A	RESILIENT BASE, 4"	NORA	STYLE: 4" COVE BASE; COLOR: HURRICANE 6266
	RB-B	RESILIENT BASE, 6"	NORA	STYLE: 6" COVE BASE; COLOR: HURRICANE 6266
	RST	RESILIENT STAIR TREAD	NORA	COLOR: HURRICANE 6266
096516 - RESILIENT SHEET FLOORING				
	RSF	RESILIENT SHEET FLOORING	GERFLOR	STYLE: TARAFLEX SPORT M PLUS; COLOR: GOLDEN HERRINGBONE 7020
096519 - RESILIENT TILE FLOORING				
	RFT	RESILIENT FLOOR TILE / STATIC DISAPPATIVE TILE	NORA	STYLE: NORAMENT GRANO ED; COLOR: BLACK PEPPER 5304
096700 - FLUID APPLIED FLOORING AND WALLS				
	RES	RESINOUS FLOORING	SHERWIN WILLIAMS	STYLE: DECO FLAKE, 1/8" FLAKE; COLOR: TUNGSTEN
096813 - TILE CARPETING				
	C-TILE-A	CARPET TILE	MANNINGTON	STYLE: PATCHWORK PANACHE; COLOR: CHIC REVIVAL VIBE
	C-TILE-B	CARPET TILE [WALK-OFF]	TARKETT	STYLE: ABRASIVE ACTION II; COLOR: VINTER GREY
096817 - TEXTILE COMPOSITE FLOORING				
	TCF	TEXTILE COMPOSITION FLOORING	FORBO	STYLE: FLOTEX; PATTERN: BOX CROSS; COLOR: BLUEBERRY
097200 - WALL COVERINGS				
	IRWC-1	IMPACT RESISTANT WALL COVERING [TYPICAL]	INPRO	STYLE: RICOCHET; PATTERN: WHIRLWIND; COLOR: DASH
	IRWC-2	IMPACT RESISTANT WALL COVERING [ACCENT]	INPRO	STYLE: RICOCHET; PATTERN: SPARK; COLOR: SILVER BELLS
098300 - ACOUSTIC FINISHES				
	AWC	ACOUSTIC WALL COVERING	MDC	STYLE: MONROE; COLOR: BRIAR
098430 - SOUND ABSORBING WALL AND CEILING UNITS				
	AWP-A1	ACOUSTIC WALL PANEL	FILZFELT	STYLE: INDEX LINEAR; COLOR: SILBER 428
	AWP-A2	ACOUSTIC WALL PANEL	FILZFELT	STYLE: INDEX LINEAR; COLOR: INDIGO 533
	AWP-B	ACOUSTIC WALL PANEL	FILZFELT	STYLE: RIBSY; COLOR: GLETSCHER 613
099100 - PAINTING				
	EPX-PT	EPOXY PAINT	SHERWIN WILLIAMS	MATCH PT AS INDICATED IN SCHEDULE
	PT-1	PAINT [FIELD]	SHERWIN WILLIAMS	DRIFT OF MIST SW 9166
	PT-2	PAINT [DOOR / TRIM]	SHERWIN WILLIAMS	PEPPERCORN SW 7674
	PT-3	PAINT [RESTROOM / CEILING]	SHERWIN WILLIAMS	PURE WHITE SW 7005
	PT-4	PAINT [ACCENT]	SHERWIN WILLIAMS	NAVAL SW 6244
102600 - WALL AND DOOR PROTECTION				
	CG	CORNER GUARDS	CS	STYLE: ACROVYN VA; COLOR: WHITE 949
	MISC-2	IMPACT RESISTANT CHAIR RAIL [CORRIDOR]	CS	STYLE: VICTORIAN FR-451; ACROVYN COLOR: WHITE 949
	MISC-3	IMPACT RESISTANT CHAIR RAIL [TYPICAL]	CS	STYLE: NEOCLASSIC FR-251; ACROVYN COLOR: WHITE 949
105113.13 - METAL EVIDENCE LOCKERS				
	MISC-4	METAL EVIDENCE LOCKERS	SPACESAVER	COLOR: TBD
122400 - WINDOW SHADES				
	MISC-5	WINDOW SHADES	DRAPER	STYLE: E SCREEN, 1% OPENNESS; COLOR: WHITE/LINEN

FINISH SCHEDULE GENERAL NOTES

A. FINISH SCHEDULE DESCRIBES ONLY THE BASIC OR PREDOMINANT SURFACE FINISH.

B. PROVIDE SAME FINISHES AS THE ADJACENT SPACE IN ALCOVES AND CONTINUOUS SPACES WITHOUT DESIGNATED SPACE NUMBERS.

C. CASEWORK FINISHES ARE NOT NOTED IN THE FINISH SCHEDULE. REFER TO CASEWORK ELEVATIONS AND SPECIFICATIONS FOR MATERIALS AND FINISHES.

D. DIRECTIONAL WALL FINISH INDICATORS (NORTH, EAST, SOUTH, WEST) REFER TO THE "PLAN" NORTH ORIENTATION.

E. BULKHEADS AND SOFFITS MAY NOT BE INDICATED IN FINISH SCHEDULES. REFER TO RCP DETAILS, AND OTHER DOCUMENTS FOR EXTENT.

F. PROVIDE CONTINUOUS SEALANT BETWEEN INTERIOR SLAB-ON-GRADE AND VERTICAL ELEMENT WHERE JOINT IS NOT CONCEALED BY FINISH BASE OR OTHER CONSTRUCTION

G. REFER TO SPECIFICATIONS FOR INFORMATION ON FINISH FIRE CLASSIFICATION RATING.

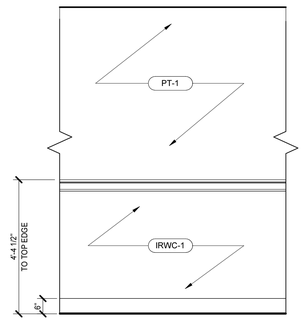
H. PAINT ALL EXPOSED ELEMENTS (SUCH AS PIPING AND CONDUITS) TO MATCH ADJACENT COLOR (HIDE & BLEND).

I. UON CEILINGS TO BE PAINTED PT-1.

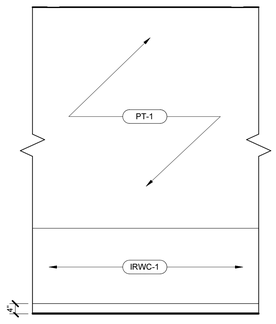
J. PROVIDE CORNER GUARDS AT ALL OUTSIDE GYPSUM BOARD CORNERS.

FINISH SCHEDULE NOTES

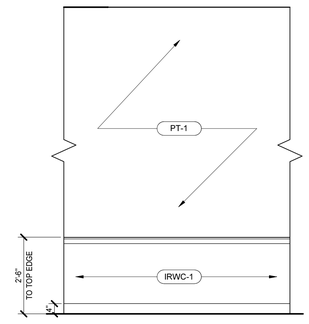
1. STAIR TREADS AND PLATFORM SHALL BE DIAMOND TREAD GALVANIZED METAL. HANDRAILS SHALL BE GALVANIZED. GUARD RAILINGS, STRINGERS, KICKPLATE, SUPPORT BEAMS, COLUMNS, AND CANE-DETECTION RAILINGS UNDER STAIRS SHALL BE SHOP PRIMED AND FIELD PAINTED.
2. IMPACT RESISTANT MOLDING AT 30"H WITH IMPACT RESISTANT WALL PANELING BELOW. REFER TO ELEVATION 1/A7.2.1.
3. IMPACT RESISTANT MOLDING AT 36"H. REFER TO ELEVATION 2/A7.2.1.
4. IMPACT RESISTANT MOLDING AT 48"H WITH IMPACT RESISTANT PANELING BELOW. REFER TO ELEVATION 3/A7.2.1.
5. EXISTING FINISH TO BE CLEANED.
6. PLAM-B CASEWORK.
7. ACOUSTIC WALLCOVERING AT 24" AFF AND RAILROADED AT FULL WIDTH.



3 TYP A7.0.1 **ELEVATION TYP. 52 1/2"H MOLDING AND BASE**
1/2" = 1'-0"



2 TYP A7.0.1 **ELEVATION TYP. 36"H MOLDING AND BASE**
1/2" = 1'-0"



1 TYP A7.0.1 **ELEVATION TYP. 30"H MOLDING AND BASE**
1/2" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

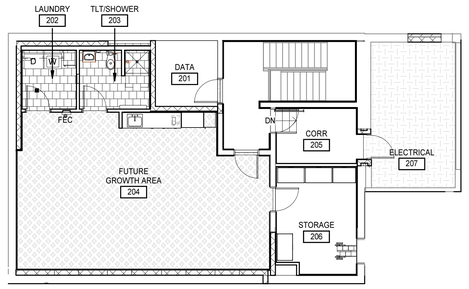
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
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DATE	DESCRIPTION

FINISH SCHEDULE AND ELEVATIONS

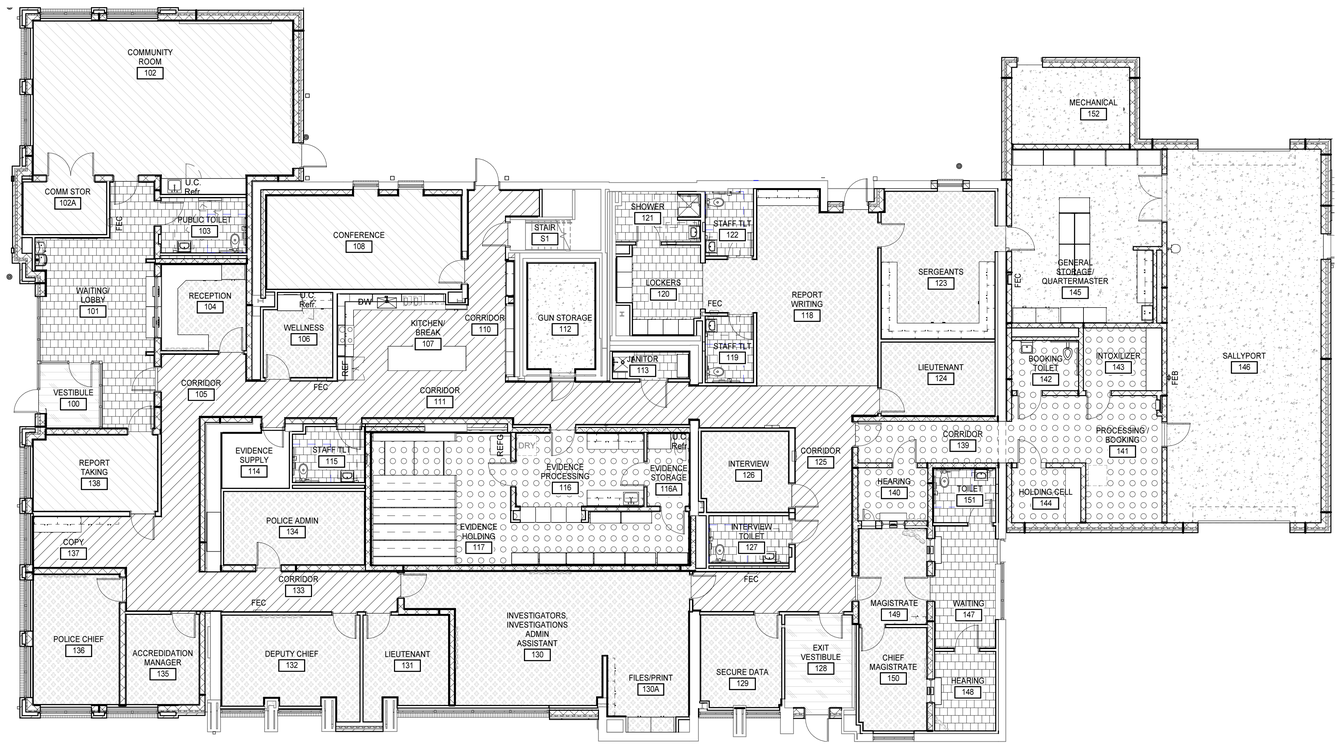
A7.0.1

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2 A0.2.2 A7.1.1 **FINISH PLAN - SECOND FLOOR**

1/8" = 1'-0"



1 A0.2.2 A7.1.1 **FINISH PLAN - FIRST FLOOR**

1/8" = 1'-0"

FINISH PLAN LEGEND

NAME
NUMBER
Floor Finish
Base Finish
Wall Finish
Ceiling Finish
Wainscot
← FINISH PLAN TAG

PREDOMINATE WALL FINISH; REFER TO A7.0.1 AND FINISH FLOOR PLANS FOR ADDITIONAL INFORMATION.

A-PT — WALL FINISH EXTENTS

CT / CT — FLOOR FINISH TRANSITION, CHANGE OF MATERIAL

CG-X — CORNER GUARD

C-TILE A
C-TILE B
TCF
RFT/RST
P-TILE A
RES
SDT
CONC-SLR

*UNO, HATCHES DO NOT INDICATE FLOOR INSTALLATION PATTERN, METHOD OR DIRECTION. HATCHES INDICATE START AND STOP OF FINISHES ONLY.

FINISH PLAN GENERAL NOTES

A. REFER TO A0.1.1 FOR ABBREVIATION LEGEND.

B. WHERE ONE FINISH IS LISTED ON ALL WALLS OF THE ROOM, THE FINISH PLANS DO NOT SHOW EXTENT OF FINISH. FINISH PLANS AND ELEVATIONS SHOW EXTENT OF MATERIALS WHERE FINISH SCHEDULE LISTS MULTIPLE FINISHES IN ONE ROOM

C. DIRECTIONAL WALL FINISH INDICATORS (NORTH, SOUTH, EAST, WEST) REFER TO THE 'PLAN' NORTH ORIENTATION.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7355
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

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FINISH PLAN

A7.1.1

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	PATTERN	SIZE	COLOR
A		24"W X 6"H	TBD
B		24"W X 6"H	TBD

ACOUSTIC WALL PANEL SCHEDULE [AWP-B]

	PATTERN	SIZE	COLOR
C		24"W X 6"H	TBD

INTERIOR ELEVATION GENERAL NOTES

A. UNLESS INDICATED OTHERWISE, ALL COUNTERTOP(S):
   a. 2'-10" AFF MAX OR 2'-10" MAX TO TOP OF RIM AT DROP-IN SINKS AND LAVATORIES WHERE OCCURS
   b. 2'-1" DEEP
   c. QUARTZ SOLID SURFACE
   d. BACKSPLASHES: 4" HIGH AT ALL SIDES AND BACK
   e. EXTEND COUNTERTOP 1/2" PAST BASE CABINET AT ALL EXPOSED CASEWORK ENDS
   f. VERIFY SLAB LEVELNESS AT CASEWORK PRIOR TO INSTALL. CONSTRUCTION TOLERANCES DO NOT APPLY TO ACCESSIBILITY DIMENSIONS; MAX DIMENSIONS SHALL BE MAINTAINED.

B. UNLESS INDICATED OTHERWISE, ALL BASE CABINET(S):
   a. 2'-0" DEEP NOMINAL
   b. TOE KICKS: 4" NOMINAL HIGH (REDUCE AS NEEDED FOR TOLERANCES) AND 3" DEEP
   c. SINK LOCATIONS: COMPLY WITH APPLICABLE ACCESSIBILITY CODE AND STANDARD REQUIREMENTS AS REFERENCED ON THE LIFE SAFETY DRAWINGS AND PROVIDE CLEAR FLOOR SPACE

C. UNLESS INDICATED OTHERWISE, ALL WALL CABINET(S):
   a. 1'-0 1/2" DEEP NOMINAL
   b. 2'-6" HIGH
   c. TOP AT 7'-0" AFF
   d. MINIMUM 11" CLEAR INTERIOR DEPTH

D. UNLESS INDICATED OTHERWISE, ALL TALL CABINET(S):
   a. 2'-0" DEEP NOMINAL
   b. 7'-0" HIGH
   c. TOE KICKS: 4" HIGH AND 3" DEEP

E. BUILT-IN EQUIPMENT: SIZE OPENING (HEIGHT, WIDTH, AND DEPTH) AND ROUGH-IN REQUIREMENTS AS REQUIRED BASED ON APPROVED MANUFACTURER SUBMITTED.

F. ALL SHELVES: ADJUSTABLE UNLESS INDICATED OTHERWISE.

G. PROVIDE FINISH END PANELS AT ALL EXPOSED CASEWORK ENDS.

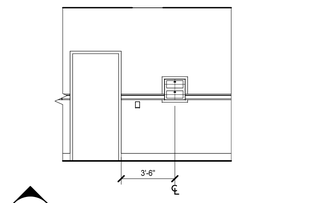
H. LOCKS: ALL KITCHEN CABINETS WITH FRAMED GLASS SLIDING DOORS, CASEWORK IN INTOXILYZER ROOM, AND EACH INDIVIDUAL FILE DRAWER UNLESS OTHERWISE NOTED.

FLOOR PATTERN KEYNOTES

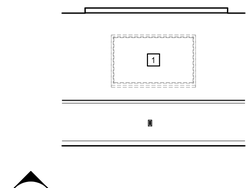
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APPLIES TO DRAWING A7.2.1

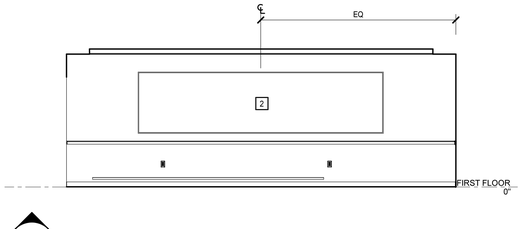
1	MONITOR, NIC
2	MARKERBOARD
3	MURAL
4	UNDERCOUNTER REFRIGERATOR 24"W
5	BI-LEVEL WATER COOLER WITH WATER BOTTLE FILLER.
6	BULLET-RESISTANT SHIELDED SPEAK-THROUGH. REFER TO A6.1.2.
7	DIMENSIONAL TEXT
8	ALUMINUM SIGNAGE ON STANDOFFS



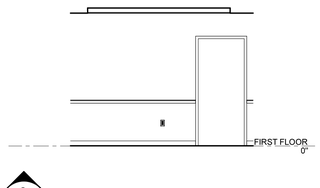
A1.1.1 | A7.2.1 1/4" = 1'-0"



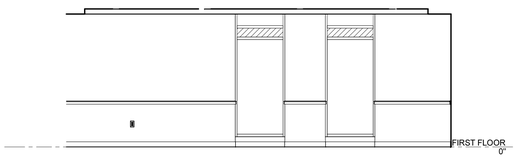
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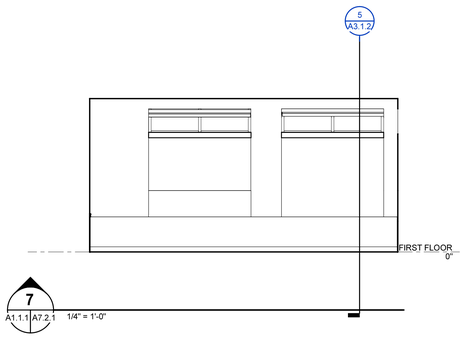
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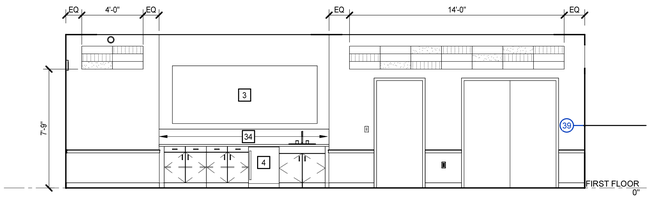
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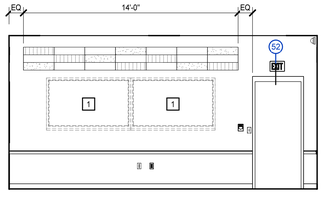
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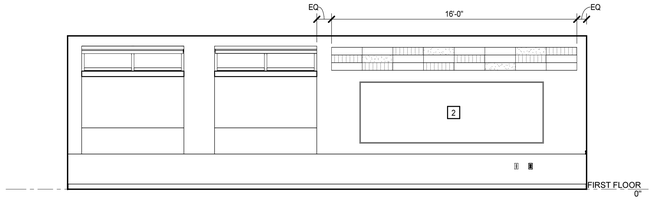
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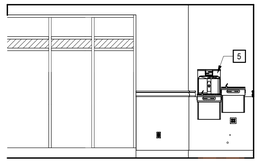
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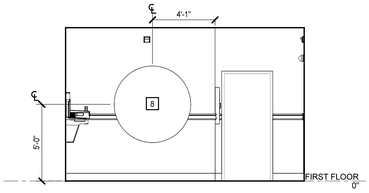
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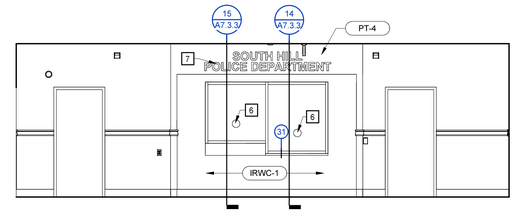
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A1.1.1 | A7.2.1 1/4" = 1'-0"



3
A1.1.1 | A7.2.1 1/4" = 1'-0"



2 **LOBBY, NORTH**
A1.1.1 | A7.2.1 1/4" = 1'-0"



1
A7.2.1 1/4" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

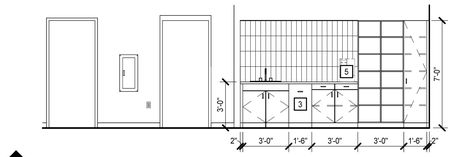
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SUBMITTAL: BID SET

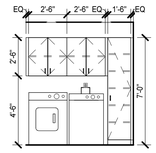
REVISIONS	
DATE	DESCRIPTION

A7.2.1

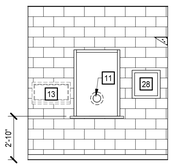
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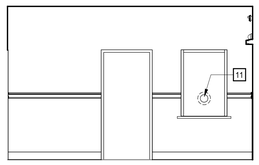
WATER COOLERS 204, NORTH
1/4" = 1'-0"



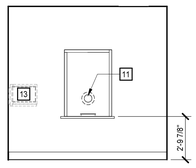
LAUNDRY 202, WEST
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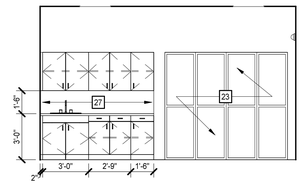
LEO HEARING, SOUTH
1/4" = 1'-0"



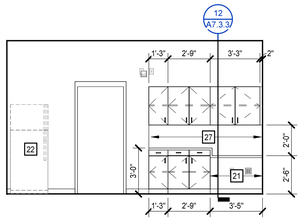
MAGISTRATE LOBBY, WEST
1/4" = 1'-0"



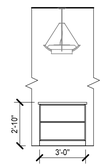
PUBLIC HEARING, WEST
1/4" = 1'-0"



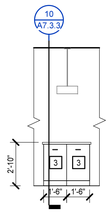
9 EVIDENCE PROCESSING, SOUTH
1/4" = 1'-0"



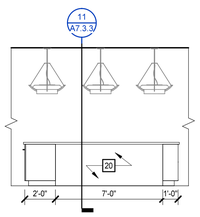
8 EVIDENCE PROCESSING, NORTH
1/4" = 1'-0"



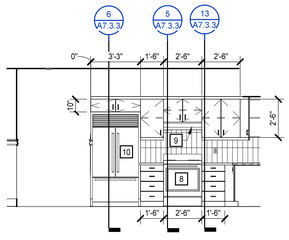
7 KITCHEN ISLAND, WEST
1/4" = 1'-0"



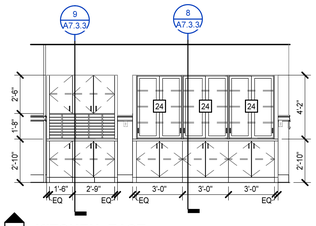
6 KITCHEN ISLAND, EAST
1/4" = 1'-0"



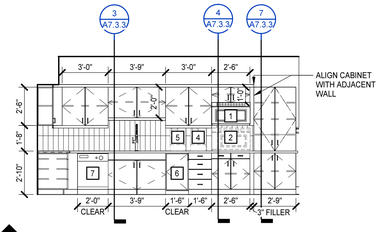
5 KITCHEN ISLAND, NORTH
1/4" = 1'-0"



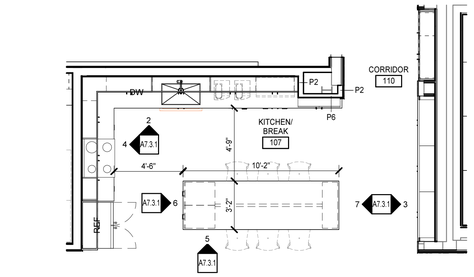
4 KITCHEN, WEST
1/4" = 1'-0"



3 KITCHEN, EAST
1/4" = 1'-0"



2 KITCHEN, NORTH
1/4" = 1'-0"



1 ENLARGED PLAN KITCHEN
A1.1.1 A7.3.1
1/4" = 1'-0"

INTERIOR ELEVATION GENERAL NOTES

A. UNLESS INDICATED OTHERWISE, ALL COUNTERTOP(S):
   a. 2'-10" AFF MAX OR 2'-10" MAX TO TOP OF RIM AT DROP-IN SINKS AND LAVATORIES WHERE OCCURS
   b. 2'-1" DEEP
   c. QUARTZ SOLID SURFACE
   d. BACKSPLASHES: 4" HIGH AT ALL SIDES AND BACK
   e. EXTEND COUNTERTOP 1/2" PAST BASE CABINET AT ALL EXPOSED CASEWORK ENDS
   f. VERIFY SLAB LEVELNESS AT CASEWORK PRIOR TO INSTALL. CONSTRUCTION TOLERANCES DO NOT APPLY TO ACCESSIBILITY DIMENSIONS; MAX DIMENSIONS SHALL BE MAINTAINED.

B. UNLESS INDICATED OTHERWISE, ALL BASE CABINET(S):
   a. 2'-0" DEEP NOMINAL
   b. TOE KICKS: 4" NOMINAL HIGH (REDUCE AS NEEDED FOR TOLERANCES) AND 3" DEEP
   c. SINK LOCATIONS: COMPLY WITH APPLICABLE ACCESSIBILITY CODE AND STANDARD REQUIREMENTS AS REFERENCED ON THE LIFE SAFETY DRAWINGS AND PROVIDE CLEAR FLOOR SPACE

C. UNLESS INDICATED OTHERWISE, ALL WALL CABINET(S):
   a. 1'-0 1/2" DEEP NOMINAL
   b. 2'-6" HIGH
   c. TOP AT 7'-0" AFF
   d. MINIMUM 11" CLEAR INTERIOR DEPTH

D. UNLESS INDICATED OTHERWISE, ALL TALL CABINET(S):
   a. 2'-0" DEEP NOMINAL
   b. 7'-0" HIGH
   c. TOE KICKS: 4" HIGH AND 3" DEEP

E. BUILT-IN EQUIPMENT: SIZE OPENING (HEIGHT, WIDTH, AND DEPTH) AND ROUGH-IN REQUIREMENTS AS REQUIRED BASED ON APPROVED MANUFACTURER SUBMITTED.

F. ALL SHELVES: ADJUSTABLE UNLESS INDICATED OTHERWISE.

G. PROVIDE FINISH END PANELS AT ALL EXPOSED CASEWORK ENDS.

H. LOCKS: ALL KITCHEN CABINETS WITH FRAMED GLASS SLIDING DOORS, CASEWORK IN INTOXILYZER ROOM, AND EACH INDIVIDUAL FILE DRAWER UNLESS OTHERWISE NOTED.

CASEWORK KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A7.3.1 - A7.3.X

1	BUILT-IN MICROWAVE
2	COUNTERTOP MICROWAVE, NIC
3	PULL-OUT TRASH DRAWERS
4	COFFEE MACHINE (WATER LINE), NIC
5	WATER DISPENSER, NIC
6	34"H UNDERCOUNTER ICE MAKER
7	34"H DISHWASHER
8	30" RANGE
9	RANGE HOOD
10	FRENCH DOOR REFRIGERATOR
11	BULLET-RESISTANT SHIELDED SPEAK-THROUGH. REFER TO A6.1.2.
12	TABLETOP PRINTER, NIC
13	MONITOR, NIC
14	UNDERCOUNTER REFRIGERATOR 24"W
15	MURAL
16	UNDERCOUNTER REFRIGERATOR, 18"W
17	PROVIDE HASP LATCH HARDWARE FOR DRAWERS TO ACCOMODATE USER PROVIDED LOCK
18	FREESTANDING COPIER/PRINTER, NIC
19	FREESTANDING UTILITY SINK
20	FULL MODESTY PANEL
21	OPEN KNEE SPACE. PROVIDE STEEL WORKSTATION BRACKETS AS INDICATED IN SPECIFICATION.
22	EVIDENCE DRYING CABINET, NIC
23	PASS-THRU EVIDENCE LOCKERS
24	CABINETS WITH FRAMED GLASS SLIDING DOORS, TACKABLE BACK, ADJUSTABLE GLASS SHELVES, AND INTEGRATED LIGHTING
25	METAL SHELVING
26	HANGING FILE DRAWERS
27	STAINLESS STEEL
28	WALL ACCESS PANEL
29	12"D SHELF
30	ACCESSIBLE SINK BASE WITH ATTACHED TOE KICK
31	SSM. FULL HEIGHT TO UNDERSIDE OF CABINET. ELECTRICAL COVER PLATES SHALL BE MOUNTED FLUSH WITH FACE OF BACKPLASH MATERIAL
32	SSM, 12"H EXTENDED BACKSPLASH. ELECTRICAL COVER PLATES SHALL BE MOUNTED FLUSH WITH FACE OF BACKSPLASH MATERIAL
33	SSM COUNTERTOP AND BACKSPLASH
34	QSM, 12"H EXTENDED BACKSPLASH. ELECTRICAL COVER PLATES SHALL BE MOUNTED FLUSH WITH FACE OF BACKSPLASH MATERIAL

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

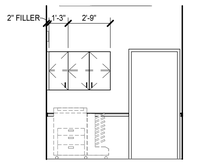
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS
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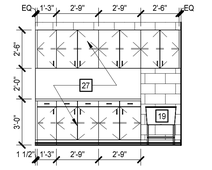
ENLARGED CASEWORK PLANS AND ELEVATIONS

A7.3.1

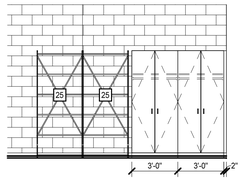
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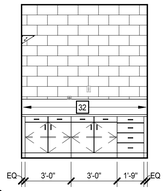
MAGISTRATE, SOUTH
1/4" = 1'-0"



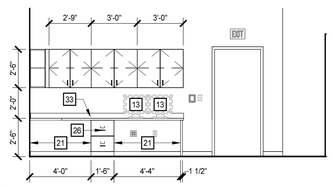
GUN CLEANING, SOUTH
1/4" = 1'-0"



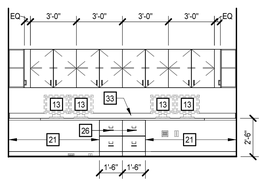
QUARTERMASTER, SOUTH
1/4" = 1'-0"



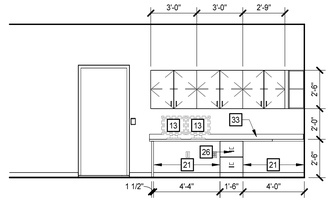
INTOX, EAST
1/4" = 1'-0"



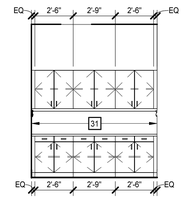
SERGEANTS, WEST
1/4" = 1'-0"



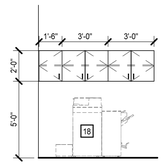
SERGEANTS, SOUTH
1/4" = 1'-0"



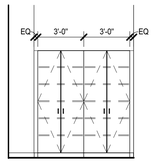
SERGEANTS, EAST
1/4" = 1'-0"



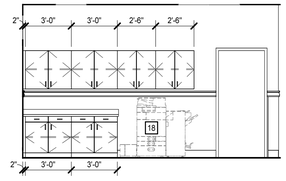
5 REPORT WRITING, NORTH
1/4" = 1'-0"



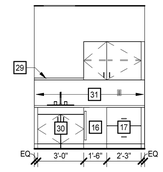
9 INVESTIGATIONS FILES/PRINT, WEST
1/4" = 1'-0"



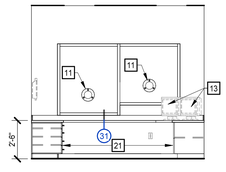
8 INVESTIGATIONS FILE/PRINT, SOUTH
1/4" = 1'-0"



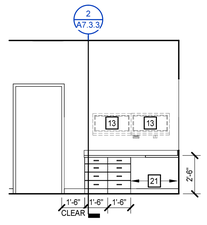
7 COPY ROOM, NORTH
1/4" = 1'-0"



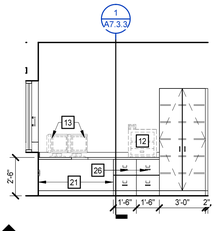
6 WELLNESS ROOM, NORTH
1/4" = 1'-0"



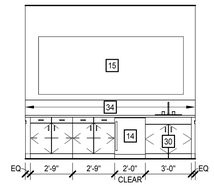
4 RECEPTION, WEST
1/4" = 1'-0"



3 RECEPTION, SOUTH
1/4" = 1'-0"



2 RECEPTION, NORTH
1/4" = 1'-0"



1 COMMUNITY ROOM BUFFET, SOUTH
1/4" = 1'-0"

INTERIOR ELEVATION GENERAL NOTES

A. UNLESS INDICATED OTHERWISE, ALL COUNTERTOP(S):
   a. 2'-10" AFF MAX OR 2'-10" MAX TO TOP OF RIM AT DROP-IN SINKS AND LAVATORIES WHERE OCCURS
   b. 2'-1" DEEP
   c. QUARTZ SOLID SURFACE
   d. BACKSPLASHES: 4" HIGH AT ALL SIDES AND BACK
   e. EXTEND COUNTERTOP 1/2" PAST BASE CABINET AT ALL EXPOSED CASEWORK ENDS
   f. VERIFY SLAB LEVELNESS AT CASEWORK PRIOR TO INSTALL. CONSTRUCTION TOLERANCES DO NOT APPLY TO ACCESSIBILITY DIMENSIONS; MAX DIMENSIONS SHALL BE MAINTAINED.

B. UNLESS INDICATED OTHERWISE, ALL BASE CABINET(S):
   a. 2'-0" DEEP NOMINAL
   b. TOE KICKS: 4" NOMINAL HIGH (REDUCE AS NEEDED FOR TOLERANCES) AND 3" DEEP
   c. SINK LOCATIONS: COMPLY WITH APPLICABLE ACCESSIBILITY CODE AND STANDARD REQUIREMENTS AS REFERENCED ON THE LIFE SAFETY DRAWINGS AND PROVIDE CLEAR FLOOR SPACE

C. UNLESS INDICATED OTHERWISE, ALL WALL CABINET(S):
   a. 1'-0 1/2" DEEP NOMINAL
   b. 2'-6" HIGH
   c. TOP AT 7'-0" AFF
   d. MINIMUM 11" CLEAR INTERIOR DEPTH

D. UNLESS INDICATED OTHERWISE, ALL TALL CABINET(S):
   a. 2'-0" DEEP NOMINAL
   b. 7'-0" HIGH
   c. TOE KICKS: 4" HIGH AND 3" DEEP

E. BUILT-IN EQUIPMENT: SIZE OPENING (HEIGHT, WIDTH, AND DEPTH) AND ROUGH-IN REQUIREMENTS AS REQUIRED BASED ON APPROVED MANUFACTURER SUBMITTED.

F. ALL SHELVES: ADJUSTABLE UNLESS INDICATED OTHERWISE.

G. PROVIDE FINISH END PANELS AT ALL EXPOSED CASEWORK ENDS.

H. LOCKS: ALL KITCHEN CABINETS WITH FRAMED GLASS SLIDING DOORS, CASEWORK IN INTOXILYZER ROOM, AND EACH INDIVIDUAL FILE DRAWER UNLESS OTHERWISE NOTED.

CASEWORK KEYNOTES

REPRESENTED BY n

APPLIES TO DRAWINGS A7.3.1 - A7.3.X

1	BUILT-IN MICROWAVE
2	COUNTERTOP MICROWAVE, NIC
3	PULL-OUT TRASH DRAWERS
4	COFFEE MACHINE (WATER LINE), NIC
5	WATER DISPENSER, NIC
6	34"H UNDERCOUNTER ICE MAKER
7	34"H DISHWASHER
8	30" RANGE
9	RANGE HOOD
10	FRENCH DOOR REFRIGERATOR
11	BULLET-RESISTANT SHIELDED SPEAK-THROUGH. REFER TO A6.1.2.
12	TABLETOP PRINTER, NIC
13	MONITOR, NIC
14	UNDERCOUNTER REFRIGERATOR 24"W
15	MURAL
16	UNDERCOUNTER REFRIGERATOR, 18"W
17	PROVIDE HASP LATCH HARDWARE FOR DRAWERS TO ACCOMODATE USER PROVIDED LOCK
18	FREESTANDING COPIER/PRINTER, NIC
19	FREESTANDING UTILITY SINK
20	FULL MODESTY PANEL
21	OPEN KNEE SPACE. PROVIDE STEEL WORKSTATION BRACKETS AS INDICATED IN SPECIFICATION.
22	EVIDENCE DRYING CABINET, NIC
23	PASS-THRU EVIDENCE LOCKERS
24	CABINETS WITH FRAMED GLASS SLIDING DOORS, TACKABLE BACK, ADJUSTABLE GLASS SHELVES, AND INTEGRATED LIGHTING
25	METAL SHELVING
26	HANGING FILE DRAWERS
27	STAINLESS STEEL
28	WALL ACCESS PANEL
29	12"D SHELF
30	ACCESSIBLE SINK BASE WITH ATTACHED TOE KICK
31	SSM, FULL HEIGHT TO UNDERSIDE OF CABINET. ELECTRICAL COVER PLATES SHALL BE MOUNTED FLUSH WITH FACE OF BACKPLASH MATERIAL
32	SSM, 12"H EXTENDED BACKSPLASH. ELECTRICAL COVER PLATES SHALL BE MOUNTED FLUSH WITH FACE OF BACKSPLASH MATERIAL
33	SSM COUNTERTOP AND BACKSPLASH
34	QSM, 12"H EXTENDED BACKSPLASH. ELECTRICAL COVER PLATES SHALL BE MOUNTED FLUSH WITH FACE OF BACKSPLASH MATERIAL

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

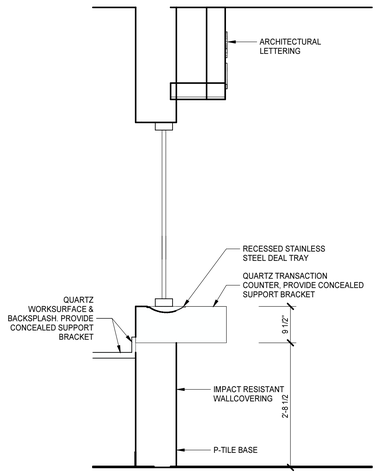
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SUBMITTAL: BID SET

REVISIONS
DATE DESCRIPTION

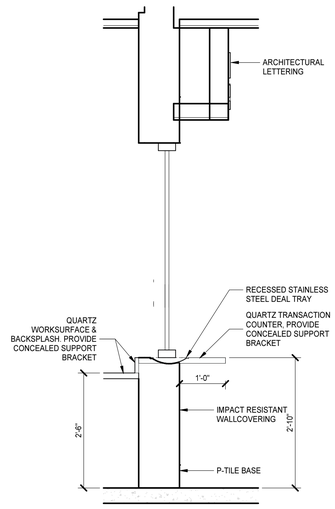
CASEWORK ELEVATIONS AND SECTIONS

A7.3.2

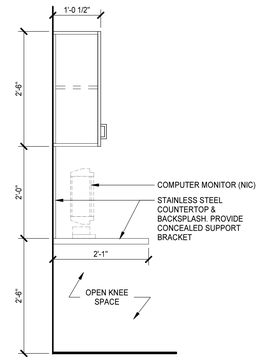
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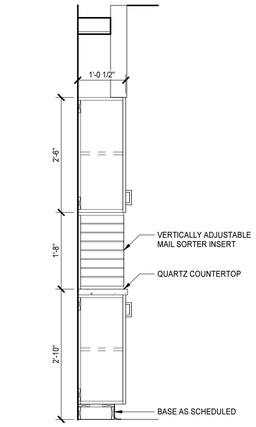
A7.2.1 A7.3.3 **DEAL TRAY 2** 3/4" = 1'-0"



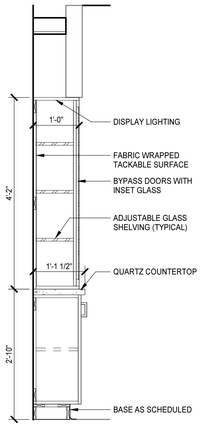
A1.4.2 A7.3.3 **DEAL TRAY** 3/4" = 1'-0"



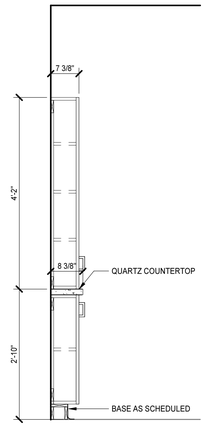
A7.3.1 A7.3.3 **EVIDENCE DESK** 3/4" = 1'-0"



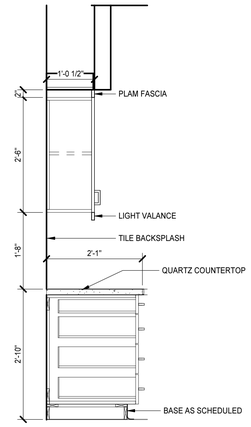
9 A7.3.1 A7.3.3 **MAILBOX** 3/4" = 1'-0"



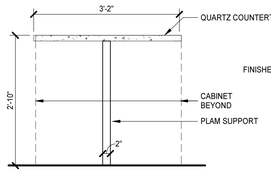
8 A7.3.1 A7.3.3 **KITCHEN DISPLAY CABS** 3/4" = 1'-0"



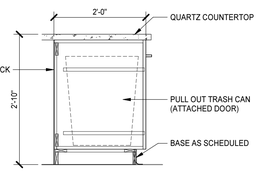
7 A7.3.1 A7.3.3 **KITCHEN SHALLOW CUP CABINET** 3/4" = 1'-0"



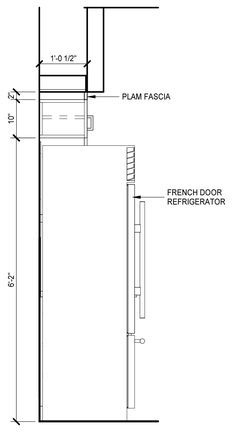
A7.3.1 A7.3.3 **KITCHEN WALL & BASE CAB W DRAWER** 3/4" = 1'-0"



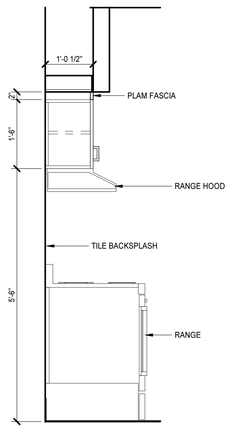
A7.3.1 A7.3.3 **KITCHEN ISLAND** 3/4" = 1'-0"



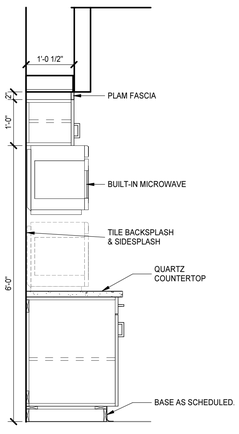
A7.3.1 A7.3.3 **KITCHEN TRASH CABS** 3/4" = 1'-0"



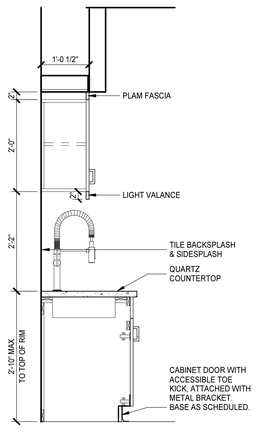
6 A7.3.1 A7.3.3 **KITCHEN REFRIGERATOR** 3/4" = 1'-0"



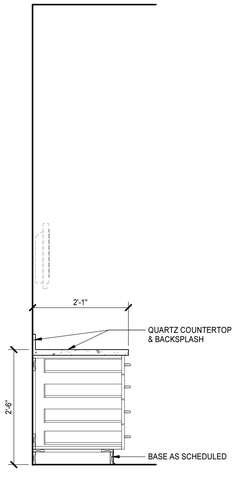
5 A7.3.1 A7.3.3 **KITCHEN RANGE & HOOD** 3/4" = 1'-0"



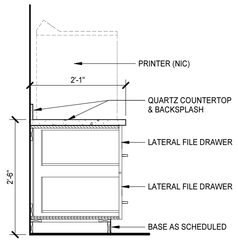
4 A7.3.1 A7.3.3 **KITCHEN, OTR CABS** 3/4" = 1'-0"



3 A7.3.1 A7.3.3 **KITCHEN, SINK BASE CAB** 3/4" = 1'-0"



2 A7.3.2 A7.3.3 **RECEPTION 4-DRAWERS** 3/4" = 1'-0"



1 A7.3.2 A7.3.3 **RECEPTION FF SECTION** 3/4" = 1'-0"

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3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
CHRISTOPHER J. ROMAN
Lic. No. 0401015628
10/21/2026
ARCHITECT

DIGITAL SIGNATURE LOCATION:

A | B | C
D | E | F

1/32"=1'-0" 0' 8' 16' 32' 64'
1/16"=1'-0" 0' 4' 8' 16' 32'
1/8"=1'-0" 0' 2' 4' 8' 16'

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

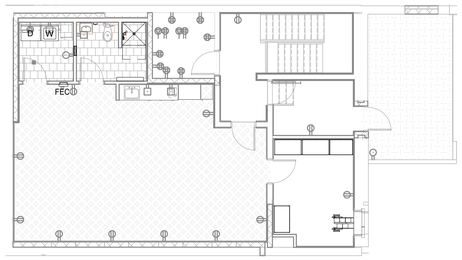
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

CASEWORK SECTIONS

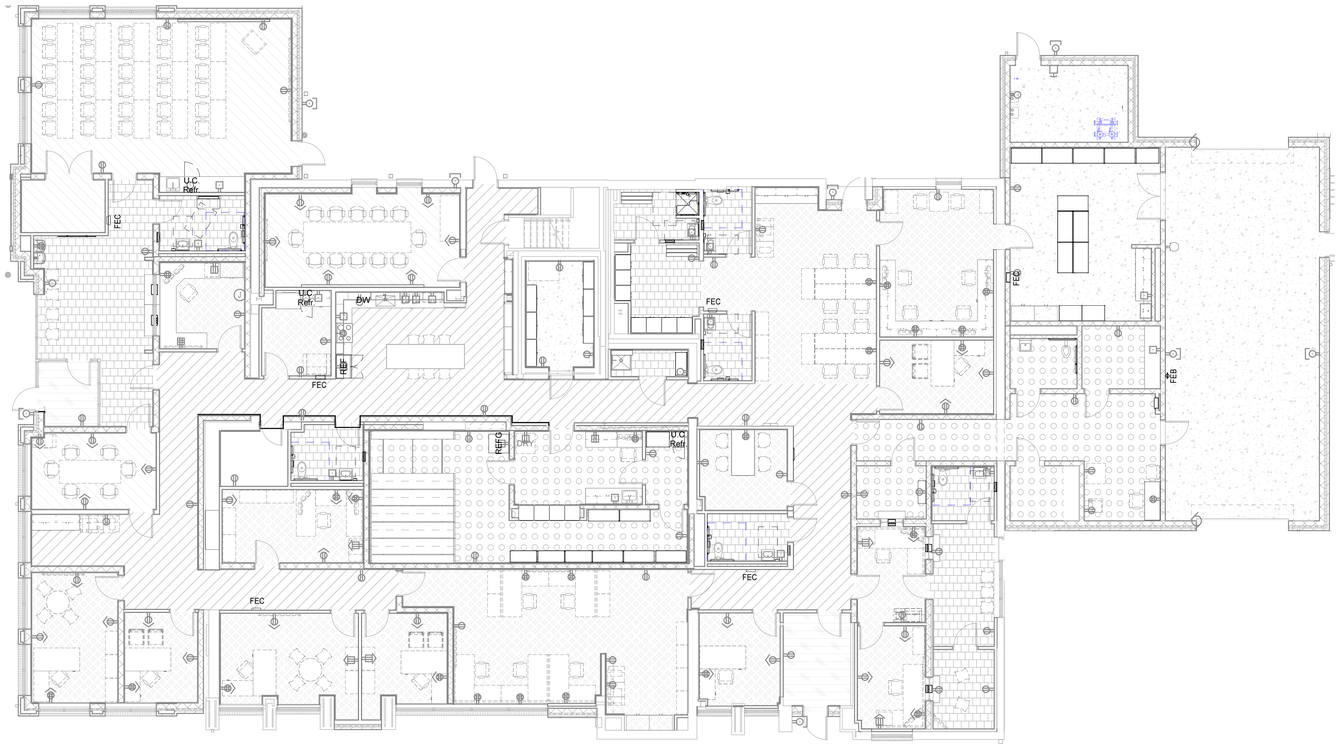
A7.3.3

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2 A0.2.2 A7.4.1 **FURNITURE PLAN - SECOND FLOOR**

1/8" = 1'-0"



1 A0.2.2 A7.4.1 **FURNITURE PLAN - FIRST FLOOR**

1/8" = 1'-0"

FURNITURE NOT IN CONTRACT. FURNITURE PLANS FOR COORDINATION ONLY.

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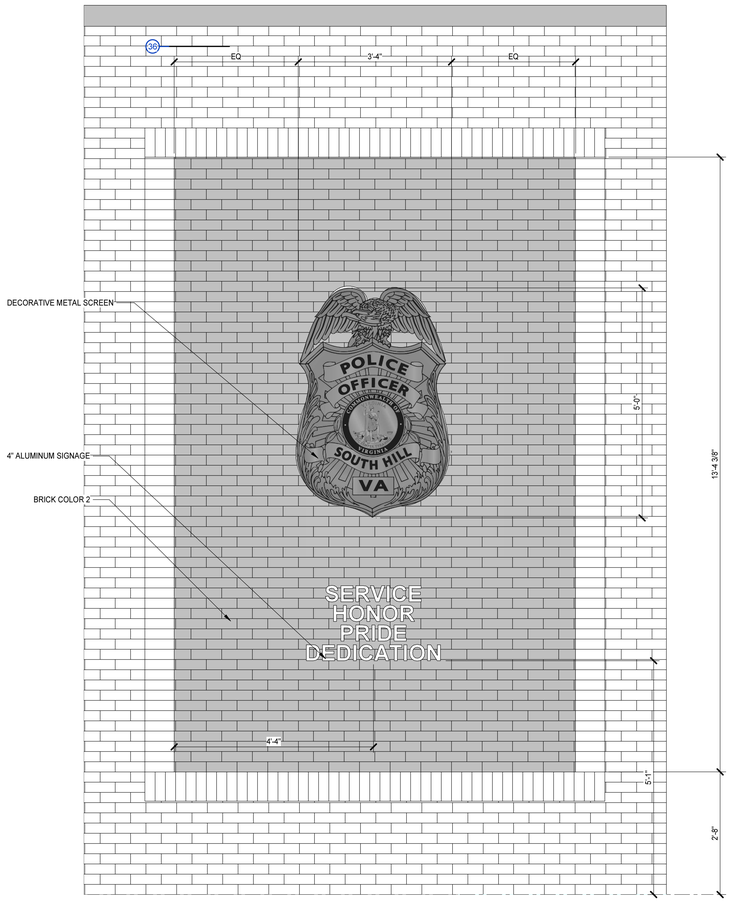
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

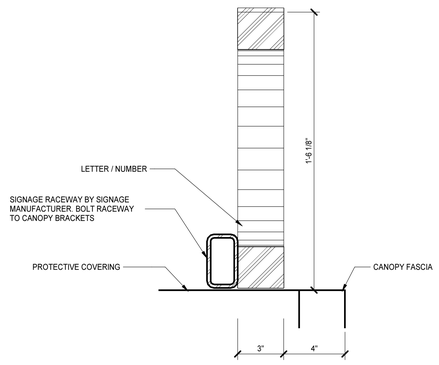
OVERALL FURNITURE PLAN

A7.4.1

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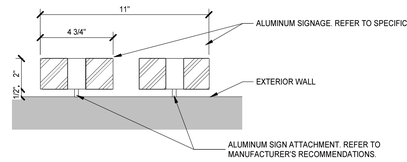
5 ELEVATION
A2.1.1 A8.1.1 3/4" = 1'-0"



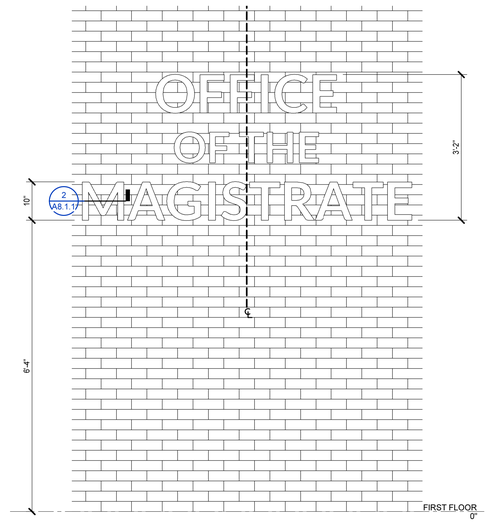
4 SECTION
A1.3.1 A8.1.1 3" = 1'-0"



3 ELEVATION
A2.1.1 A8.1.1 1/2" = 1'-0"



2 DETAIL
A8.1.1 A8.1.1 3" = 1'-0"



1 ELEVATION
A2.1.1 A8.1.1 3/4" = 1'-0"

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3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
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ARCHITECT

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

INTERIOR-EXTERIOR SIGNAGE

A8.1.1

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STRUCTURAL ABBREVIATIONS

AB	ANCHOR BOLT	HS	HIGH STRENGTH
AESS	ARCHITECTURALLY EXPOSED STRUCTURAL STEEL	HSS	HOLLOW STRUCTURAL SECTION
		HT	HEIGHT
AFF	ABOVE FINISHED FLOOR	ID	INSIDE DIAMETER
ALUM	ALUMINUM	IN	INCH
APPROX	APPROXIMATE	INFO	INFORMATION
ARCH	ARCHITECTURAL, ARCHITECT	INT	INTERIOR
AVG	AVERAGE	JBE	JOIST BEARING ELEVATION
BF	BRACE FRAME	JS	JOIST SUBSTITUTE
BLDG	BUILDING	JST	JOIST
BM	BEAM	JT	JOINT
BMC	BUILDING MOUNTED CANOPIES	K	KIP
BOT	BOTTOM	LBS	POUNDS
BRG	BEARING	LF	LINEAR FEET (FOOT)
BTWN	BETWEEN	LLH	LONG LEG HORIZONTAL
CANT	CANTILEVER	LLV	LONG LEG VERTICAL
CFSF	COLD FORMED STEEL FRAMING	M	METER(S)
CIP	CAST IN PLACE	MAS	MASONRY
CJ	CONTROL JOINT	MATL	MATERIAL
CLG	CEILING	MAX	MAXIMUM
CLR	CLEAR	MBMA	METAL BUILDING MANUFACTURER'S ASSOC
CMU	CONCRETE MASONRY UNIT		
COL	COLUMN	MBS	METAL BULIDING SYSTEM
CONC	CONCRETE	MECH	MECHANICAL
CONN	CONNECTION	MFR	MANUFACTURER
CONSTR	CONSTRUCTION	MIN	MINIMUM
CONT	CONTINUOUS	MM	MILLIMETER(S)
CTR	CENTER	NOM	NOMINAL
DBA	DEFORMED BAR ANCHOR	NS	NON SHRINK
DBL	DOUBLE	OC	ON CENTER
DIA	DIAMETER	OD	OUTSIDE DIAMETER
DIAG	DIAGONAL	OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
DIM	DIMENSION		
DN	DOWN	OPNG	OPENING
DWG	DRAWING	OPP	OPPOSITE
EA	EACH	PAF	POWDER-ACTUATED FASTENERS
EF	EACH FACE	PC CONC	PRECAST CONCRETE
EJ	EXPANSION JOINT	PFBC	PRE-FABRICATED BUILDING COLUMN
EL	ELEVATION	PLF	POUNDS PER LINEAR FOOT
ELECT	ELECTRICAL	POLY	POLYETHYLENE
ELEV	ELEVATOR	PPT	PRESSURE PRESERVATIVE TREATED
EOD	EDGE OF DECK	PSF	POUNDS PER SQUARE FOOT
EOS	EDGE OF SLAB	PTFE	POLYTETRAFLUOROETHYLENE
EQ	EQUAL	R	RADIUS
EW	EACH WAY	RD	ROOF DRAIN
EX	EXISTING	REF	REFERENCE
EXP	EXPANSION	REINF	REINFORCING, REINFORCED
EXT	EXTERIOR	REQ'D	REQUIRED
FB	FIXED BASE	SCH	SCHEDULE
FD	FLOOR DRAIN	SIM	SIMILAR
FDN	FOUNDATION	SL	SLOPE
FF	FINISHED FLOOR	SOG	SLAB ON GRADE
FIN	FINISHED	SPA	SPACES
FLR	FLOOR	SS	STAINLESS STEEL
FOB	FACE OF BRICK	STD	STANDARD
FOC	FACE OF CONCRETE	STIFF	STIFFENER
FOM	FACE OF MASONRY	STRUCT	STRUCTURAL
FRMG	FRAMING	SUSP	SUSPENDED
FRT	FIRE RETARDANT TREATED	SYM	SYMMETRY(RICAL)
FT	FOOT	T&B	TOP AND BOTTOM
FTG	FOOTING	T&G	TONGUE AND GROOVE
GA	GAGE	TF	TRANSFER FORCE
GALV	GALVANIZED	TOC	TOP OF CONCRETE
GB	GRADE BEAM	TOS	TOP OF STEEL
GC	GENERAL CONTRACTOR	TOSL	TOP OF SLAB
GRD	GRADE	TOW	TOP OF WALL
HD	HEADED	TYP	TYPICAL
HK	HOOK	UNO	UNLESS NOTED OTHERWISE
HORIZ	HORIZONTAL	VB	VAPOR BARRIER
		VERT	VERTICAL
		VIF	VERIFY IN FIELD
		VR	VAPOR RETARDER
		WP	WORK POINT
		WWF	WELDED WIRE FABRIC

PLAN LEGEND

℄	CENTERLINE
JBE (+X'-X")	JOIST BEARING ELEVATION
BP1, BP2 ...	BEAM BEARING PLATE
BP-A, BP-B ...	COLUMN BASE PLATE
H1, H2 ...	WOOD HEADER
J1, J2 ...	WOOD JOIST
T-1, T-2 ...	TRUSS
WP1, WP2 ...	WOOD POST
P-1, P-2 ...	CONCRETE PIER
JS	JOIST SUBSTITUTE
KCS	CONSTANT SHEAR JOIST
SP	SPECIAL JOIST
	WALL FOOTING STEP
-X'-X"	TOP OF FOOTING ELEVATION
WP	WORK POINT
(X'-X")	TOP OF SLAB ELEVATION
L1, L2 ...	LINTEL
X.X	COLUMN FOOTING
(+X'-X")	TOP OF STEEL BEAM ELEVATION
(J)	INDICATES TOP OF STRUCTURAL MEMBER SHALL BE IN SAME PLANE AS TOP OF JOIST
(SL)	INDICATES TOP OF STRUCTURAL MEMBER SHALL BE SLOPED
WFX.X	WALL FOOTING
	THICKENED SLAB
*	STEEL JOIST BOTTOM CHORD EXTENSION, WELDED
	STEEL BEAM MOMENT CONNECTION
(EX)	EXISTING
TF	TRANSFER FORCE
#X@XX	CMU WALL REINFORCING SIZE AND SPACING
	CHANGE IN SLAB ELEVATION
TCX	TOP CHORD EXTENSION
A	GRID LINE
EXA	EXISTING GRID LINE
N	PLAN NORTH
	TRUE NORTH ARROW

DESIGN LOAD DATA

1. CLASSIFICATION OF BUILDING
   RISK CATEGORY (IBC TABLE 1604.5) — IV

2. FLOOR LIVE LOADS

	UNIFORM	CONCENTRATED
HOLDING CELL	40 PSF	
OFFICES/KITCHEN/WELLNESS/HEARING/COPY ROOMS	50 PSF	1000 LB
STAIRS/CORRIDORS	100 PSF	2000 LB
CONFERENCE/COMMUNITY/LOCKER ROOMS	100 PSF	
VESTIBULES/WAITING/LOBBIES/BOOKING	100 PSF	
STORAGE/EVIDENCE STORAGE/SECURE DATA	125 PSF	
MECHANICAL ROOMS	150 PSF	
EVIDENCE HOLDING (HIGH DENSITY FILING)	200 PSF	
HANDRAILS AND GUARDS	50 PSF	200 LB

   LOADS ARE NOT CONCURRENT AND ARE TO BE APPLIED IN ANY DIRECTION

   CONCENTRATED LOAD APPLIED OVER 2'-6" x 2'-6" AREA.

   REDUCTION OF FLOOR LIVE LOAD HAS NOT BEEN UTILIZED.

3. ROOF LIVE LOADS

MINIMUM ROOF LIVE LOAD	20 PSF	300 LB

   CONCENTRATED LOAD APPLIED OVER 2'-6" x 2'-6" AREA.

   REDUCTION OF MINIMUM ROOF LIVE LOAD HAS NOT BEEN UTILIZED.

4. DEAD LOADS

ROOF	20 PSF

5. ROOF SNOW LOAD

GROUND SNOW LOAD (Pg)	40 PSF
EXPOSURE FACTOR (Ce)	1.0
THERMAL FACTOR (Ct)	1.0
FLAT ROOF SNOW LOAD (Pf = 0.7 x Ce x Ct x Pg)	28.0 PSF
MINIMUM LOW-SLOPE ROOF LOAD (Pm,max)	40 PSF
Pg <= Pm,max Pmin = Pg	40 PSF
SLOPED ROOF SNOW LOAD (Ps = Cs x Pf)	28.0 PSF
SNOW DRIFTING LOADS	PER ASCE 7

6. WIND DESIGN DATA

ULTIMATE DESIGN WIND SPEED (3 SECOND GUST)	124 MPH
NOMINAL DESIGN WIND SPEED (3 SECOND GUST)	95 MPH
EXPOSURE	C
INTERNAL PRESSURE COEFFICIENT (GCpi)	±0.18 (ENCLOSED)
COMPONENTS AND CLADDING WIND PRESSURE	REFER TO DWG S0.1.4 (PER IBC & ASCE 7)

7. TORNADO LOADS (RISK CATEGORY IV)

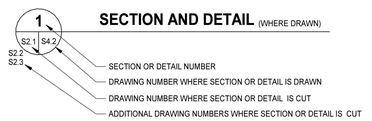
TORNADO PRONE REGION	YES
TORNADO SPEED (Vt)	63.5 MPH
Vt > 60 MPH; Vt < 0.6V	DESIGN FOR TORNADO LOADS NOT REQUIRED

8. SEISMIC DESIGN DATA

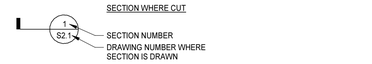
SEISMIC DESIGN CATEGORY	C
SEISMIC IMPORTANCE FACTOR (Ie)	1.50
SITE CLASS	D
MAPPED SPECTRAL RESPONSE ACCELERATIONS (Ss)	0.160
(S1)	0.058
DESIGN SPECTRAL RESPONSE ACCELERATIONS (Sds)	0.140
(Sd1)	0.080
BASIC SEISMIC FORCE RESISTING SYSTEM:	BEARING WALL SYSTEM INTERMEDIATE REINFORCED MASONRY SHEAR WALLS
ALL STEEL SYSTEMS ARE:	SYSTEMS NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE
RESPONSE MODIFICATION COEFFICIENT (R)	3.5
SYSTEM OVERSTRENGTH FACTOR	2.5
DEFLECTION AMPLIFICATION FACTOR	2.25
SEISMIC RESPONSE COEFFICIENT (Cs)	0.060
DESIGN BASE SHEAR (V = Cs x W)	0.060W
ANALYSIS PROCEDURE	EQUIVALENT LATERAL FORCE PROCEDURE

LEGEND FOR SECTION AND DETAIL MARKS

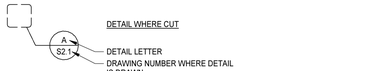
SECTION AND DETAIL (WHERE DRAWN)



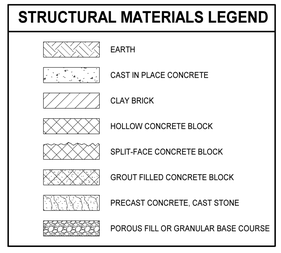
SECTION WHERE CUT



DETAIL WHERE CUT



STRUCTURAL MATERIALS LEGEND



DELEGATED DESIGN

2. ELEMENTS OF THIS PROJECT ARE DESIGNATED AS DELEGATED DESIGN, SPECIFICALLY REQUIRING PROFESSIONAL DESIGN SERVICE OF THE CONTRACTOR AND THEIR SPECIALTY ENGINEER. THE SPECIALTY ENGINEER SHALL BE LICENSED IN THE COMMONWEALTH OF VIRGINIA.

3. THE DELEGATED DESIGNS SHALL COMPLY WITH DESIGN CRITERIA INDICATED. DETAILS OF DELEGATED DESIGN COMPONENTS INDICATED IN THE CONTRACT DOCUMENTS ARE PROVIDED FOR DESIGN INTENT.

4. THE SPECIALTY ENGINEER'S RESPONSIBILITIES SHALL INCLUDE:
   A. DELEGATED DESIGN SUBMITTALS.
   B. PERIODIC FIELD REVIEW OF DELEGATED DESIGN WORK AT INTERVALS AS NECESSARY AND APPROPRIATE TO THE PROGRESS OF THE WORK. PROVIDE FIELD VISIT REPORT AFTER EACH VISIT.
   C. UPON COMPLETION OF THE DELEGATED DESIGN COMPONENTS OF THE WORK, PREPARE AND SUBMIT A FINAL REPORT INDICATING INSTALLATION IN ACCORDANCE WITH PROJECT REQUIREMENTS.

5. DELEGATED DESIGN SUBMITTAL SHALL INCLUDE DRAWINGS, CALCULATIONS AND SPECIFICATIONS SIGNED AND SEALED BY THE LICENSED PROFESSIONAL ENGINEER. DESIGN CRITERIA, MATERIAL DATA AND INSTALLATION INSTRUCTIONS SHALL BE INCLUDED IN THE SUBMITTAL.

6. DELEGATED DESIGN ELEMENTS INCLUDE:
   A. FLEXURAL STRENGTHENING OF EXISTING CMU WALLS WITH FIBER REINFORCED POLYMER (FRP), ALSO INDICATED AS CARBON FIBER REINFORCING (CFR) WITHIN THESE DRAWINGS.
   B. COLD FORMED STEEL FRAMING (CFSF).
   C. SHORING.
   D. PRE-ENGINEERED CANOPIES.

GENERAL

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE VIRGINIA CONSTRUCTION CODE (VCC), 2021 EDITION, EFFECTIVE JANUARY 18, 2024.

2. THE STRUCTURAL DRAWINGS ARE INTENDED TO BE USED IN CONJUNCTION WITH THE ARCHITECTURAL DRAWINGS AND THE DRAWINGS OF THE OTHER ENGINEERING DISCIPLINES.

3. THE CONTRACT DOCUMENTS ARE COMPLIMENTARY AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.

4. VERIFY AND COORDINATE MECHANICAL UNIT SUPPORTS AND OPENINGS WITH EQUIPMENT PURCHASED FOR THE PROJECT. COORDINATE REQUIREMENTS FOR SLEEVES, HANGERS, INSERTS, ANCHORS AND ALL OTHER ITEMS TO BE SET IN STRUCTURAL WORK.

5. SPECIAL INSPECTIONS ARE REQUIRED BY THE VCC (SECTION 1704).
   REFER TO THE STATEMENT OF SPECIAL INSPECTIONS PREPARED FOR THIS PROJECT AND THE PROJECT SPECIFICATIONS FOR SPECIFIC INSPECTION REQUIREMENTS.
   REFER TO SPECIFICATION SECTION 014000 FOR GENERAL INSPECTION REQUIREMENTS. SPECIAL INSPECTOR SHALL SUBMIT INSPECTION REPORTS IN COMPLIANCE WITH IBC SECTION 1704.2.4. USE OF "GENERAL CONFORMANCE" OR "GENERAL ACCORDANCE" IS UNACCEPTABLE.

6. CONDUCT PRE-INSTALL MEETINGS ON PROJECT SITE PRIOR TO COMMENCEMENT OF WORK. REFER TO PROJECT SPECIFICATIONS FOR SPECIFIC REQUIREMENTS. CONTRACTOR WILL CONDUCT THE MEETING AND SHALL BE RESPONSIBLE FOR THE ATTENDANCE OF ALL REQUIRED TRADES AND SUBCONTRACTORS INCLUDING THE SPECIAL INSPECTOR.

FOUNDATIONS

1. FOUNDATIONS ARE DESIGNED TO BEAR ON ORIGINAL UNDISTURBED SOIL OR CONTROLLED COMPACTED FILL WITH AN ALLOWABLE BEARING CAPACITY OF 2,000 PSF, IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEERING REPORT PREPARED BY HURT AND PROFFITT, DATED APRIL 23, 2026.

2. THE GEOTECHNICAL ENGINEERING REPORT INDICATES LOCALIZED UNDERCUTTING OF EXISTING SOILS MAY BE REQUIRED WITHIN THE BUILDING FOOTPRINT. THE GEOTECHNICAL ENGINEER FOR THE OWNERS TESTING AGENCY SHALL VERIFY BEARING CAPACITY AND SUITABILITY OF SUBGRADE PRIOR TO PLACING FOUNDATIONS AND GRADE SLABS.

3. SELECT AND PLACE CONTROLLED COMPACTED FILL UNDER DIRECT SUPERVISION OF THE GEOTECHNICAL ENGINEER FOR THE OWNERS TESTING AGENCY.

4. FOOTING STEPS FOR UNDERSLAB UTILITIES INDICATED ON FOUNDATION PLANS SHALL BE CONSIDERED APPROXIMATE. COORDINATE FOOTINGS WITH ACTUAL LOCATION, SIZE AND INVERT OF ALL UNDERGROUND PIPE (AND CONDUIT). REFER TO "FOOTING STEP" DETAIL TO STEP WALL FOOTING DOWN TO ALLOW UNDERSLAB PIPING TO PASS ABOVE THE FOOTING. ALTERNATELY, REFER TO "FOOTING SLEEVE" AND "PIPE TRENCH BACKFILL AT FOOTING" DETAILS TO ALLOW UNDERSLAB PIPING TO PASS BELOW THE TOP OF THE WALL FOOTING.

5. AVOID INFLUENCE OF PIPE TRENCH PARALLEL TO WALL FOOTING AND / OR ADJACENT TO COLUMN FOOTING. REFER TO "FOOTING EXCAVATION LIMITS".

6. PROTECT FOOTINGS AND GRADE SLABS FROM FROST HEAVE UNTIL BUILDING IS PERMANENTLY ENCLOSED.

7. BRACE WALLS PLUMB WHICH ARE SUBJECTED TO UNBALANCED BACKFILL UNTIL PERMANENTLY STABILIZED BY STRUCTURE.

CONCRETE

1. CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF ACI 318 "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" AND ACI 301 "STANDARD SPECIFICATIONS FOR STRUCTURAL CONCRETE".

2. CONCRETE SHALL BE NORMAL WEIGHT AND SHALL OBTAIN ULTIMATE 28 DAY COMPRESSIVE STRENGTHS (f'c), AS FOLLOWS:

CONCRETE MATERIAL SCHEDULE (NOTE 11)

BUILDING ELEMENT	DURABILITY REQUIREMENTS CATEGORIES AND CLASSES (NOTE 3)				f'c (psi) 28 DAY STRENGTH	MAX W/C (NOTE 4)	AIR ENTRAINMENT (NOTE 5)	UNIT WEIGHT PCF (NOTES 6a & 6b)	MAX AGGREGATE (NOTE 7 & 9)	CEMENT (NOTE 13)	CL % (NOTE 10)
	(F)	(S)	(W)	(C)							
SPREAD FOOTINGS AND WALL FOOTINGS	F0	S0	W0	C0	3,500	0.55	NONE	145 (a)	1 1/2"	I / II	1.0
INTERIOR SLABS ON GRADE	F0	S0	W0	C0	3,500	0.50	NONE	145 (a)	3/4"	I / II	1.0
INTERIOR COLUMNS, WALLS AND PIERS	F0	S0	W0	C0	4,000	0.50	NONE	145 (a)	3/4"	I / II	1.0
EXTERIOR SLABS ON GRADE	F3	S0	W2	C2	5,000	0.45	6.0	145 (a)	3/4"	I / II	0.15
EXTERIOR COLUMNS, WALLS AND PIERS	F2	S0	W1	C1	4,500	0.45	6.0	145 (a)	3/4"	I / II	0.30
INTERIOR SLABS ON METAL DECK (NORMAL WT. CONC)	F0	S0	W0	C0	3,500	0.50	NONE	145 (a)	3/4"	I / II	1.0
ELEVATED SLABS AND BEAMS	F0	S0	W0	C0	4,000	0.50	NONE	145 (a)	3/4"	I / II	1.0

3. THE DURABILITY EXPOSURE CLASS IDENTIFIED BY THE ENGINEER OF RECORD, IN ACCORDANCE WITH ACI 318, FOR EACH MIX DESIGN/BUILDING ELEMENT AND EXPOSURE CLASS, IS BASED ON ASSUMED SEVERITY OF THE ANTICIPATED EXPOSURE. IF THE CONCRETE IS TO BE INSTALLED IN A LOCATION OR CONDITION THAT IS MORE SEVERE THAN THE EXPOSURE IDENTIFIED, NOTIFY THE ENGINEER OR ADJUST THE CONCRETE MIX REQUIREMENTS AS REQUIRED PER ACI 318. CONCRETE WITH EXPOSURE CLASSIFICATION F0 SHALL BE PROTECTED FROM FREEZING UNTIL PROJECT COMPLETION.

   A. EXPOSURE CATEGORIES:
      - (F) FREEZE/THAW
      - (S) SULFATE
      - (W) WATER/PERMEABILITY
      - (C) CORROSION PROTECTION

4. MAX W/C REFERS TO MAXIMUM WATER TO CEMENTITIOUS MATERIALS RATIO. REFER TO NOTE 7 FOR CEMENTITIOUS MATERIALS LIMITATIONS. MIXING WATER SHALL CONFORM TO ASTM C1602.

5. TARGET AIR ENTRAINMENT, RANGE OF +1% TO -1.5%. TESTING SHALL BE IN ACCORDANCE WITH ASTM C231 FOR NORMAL WEIGHT CONCRETE AND ASTM C173 FOR LIGHTWEIGHT CONCRETE. TESTING SHALL OCCUR AT POINT OF PLACEMENT.

6a. DRY UNIT WEIGHT ±5 PCF. AGGREGATES TO CONFORM TO ASTM C33 FOR NORMAL WEIGHT CONCRETE.

6b. UNIT WEIGHT OF LIGHTWEIGHT CONCRETE SHALL COMPLY WITH THE UL REQUIREMENTS OF THE RATED SLAB. AGGREGATES TO CONFORM TO ASTM C330 FOR LIGHTWEIGHT CONCRETE.

7. CONCRETE BUILDING ELEMENTS IDENTIFIED WITH EXPOSURE CATEGORY F3 REQUIRE LIMITATIONS ON CEMENTITIOUS MATERIALS AS FOLLOWS:

CEMENTITIOUS MATERIAL	MAX % OF TOTAL CEMENTITIOUS MATERIALS BY MASS
• FLY ASH (ASTM C618)	25
• SLAG CEMENT (ASTM C989)	50
• SILICA FUME (ASTM C1240)	10
• TOTAL FLY ASH OR OTHER POZZOLANS, AND SILICA FUME	35
• TOTAL FLY ASH OR OTHER POZZOLANS, SILICA FUME AND SLAG CEMENT	50

8. AIR ENTRAINMENT OF LIGHT WEIGHT CONCRETE SHALL COMPLY WITH THE UL REQUIREMENTS OF THE RATED SLAB. FINISHING METHODS FOR AIR-ENTRAINED LIGHTWEIGHT SLABS SHALL BE SUBMITTED PRIOR TO THE PRE-INSTALLATION MEETING AND WILL BE REVIEWED AT THE MEETING.

9. COMBINED AGGREGATE GRADING SHALL BE AS FOLLOWS:

   - FOR COARSE AGGREGATE WITH 1 1/2" NOMINAL MAXIMUM AGGREGATE SIZE, 8% TO 18% (BY WEIGHT) OF AGGREGATE SHALL BE RETAINED ON EACH SIEVE BELOW THE MAXIMUM AGGREGATE SIZE SIEVE AND ABOVE THE #100 SIEVE.
   - FOR COARSE AGGREGATE WITH 3/4" OR 1" NOMINAL MAXIMUM AGGREGATE SIZE, 8% TO 22% (BY WEIGHT) OF AGGREGATE SHALL BE RETAINED ON EACH SIEVE BELOW THE MAXIMUM AGGREGATE SIZE SIEVE AND ABOVE THE #100 SIEVE.

10. MAX WATER SOLUBLE CHLORIDE ION CONTENT PERCENTAGE, BY WEIGHT OF CEMENT.

11. CONCRETE MIXTURE PROPORTIONS SHALL BE ESTABLISHED IN ACCORDANCE WITH ARTICLE 4.2.3 OF ACI 301 OR BY AN ALTERNATIVE METHOD ACCEPTABLE TO THE ENGINEER OF RECORD. EACH MIX DESIGN SHALL IDENTIFY THE INTENDED LOCATION OF USE.

12. REINFORCING STEEL SHALL BE AS FOLLOWS:

• REINFORCING BARS:	ASTM A615, GRADE 60, DEFORMED
• WELDED WIRE FABRIC:	ASTM A1064, SHEET TYPE ONLY
• WELDABLE REINFORCING BARS:	ASTM A706 LOW ALLOW STEEL REINFORCING BARS, DEFORMED
• DEFORMED BAR ANCHORS (DBA)	ASTM A1064, DEFORMED
• WELDING PER AWS D1.4 STRUCTURAL WELDING CODE - REINFORCING STEEL	

13. TYPE IL CEMENT MAY BE SUBSTITUTED FOR TYPE I / II CEMENT. CEMENT SHALL BE IN ACCORDANCE WITH ASTM C150.

14. MINIMUM CONCRETE COVER OVER REINFORCING SHALL BE UNO:

A. UNFORMED SURFACE CAST AGAINST EARTH	3 IN
B. FORMED SURFACE EXPOSED TO EARTH/WEATHER	2 IN
C. FORMED SLABS AND WALLS NOT EXPOSED TO EARTH/WEATHER FOR #11 AND SMALLER BAR	3/4 IN
D. OTHER FORMED ELEMENTS NOT EXPOSED TO EARTH/WEATHER	1 1/2 IN

15. REQUIRED COMPRESSIVE STRENGTH OF STRUCTURAL PRECAST CONCRETE SHALL BE DETERMINED BY THE PRECAST CONCRETE MANUFACTURER'S ENGINEER, WITH THE MINIMUM COMPRESSIVE STRENGTH AS NOTED IN THE TABLE.

STEEL JOISTS

1. ALL STEEL JOIST WORK SHALL CONFORM TO THE LATEST EDITION OF THE STEEL JOIST INSTITUTE (SJI) STANDARD SPECIFICATIONS.

2. STEEL JOISTS SHALL BE DESIGNED USING ALLOWABLE STRENGTH DESIGN (ASD), AND SHALL BE MANUFACTURED WITH STEEL HAVING A MINIMUM YIELD STRENGTH OF 50 KSI.

3. PROVIDE JOIST BRIDGING IN ACCORDANCE WITH SJI SPECIFICATIONS, OSHA REQUIREMENTS, AND AS REQUIRED BY JOIST DESIGN.

4. ROOF JOISTS AND BRIDGING SHALL BE DESIGNED FOR A NET UPLIFT OF 15 PSF.

5. SPECIAL JOISTS, INDICATED "SP" ON FRAMING PLANS, SHALL BE DESIGNED FOR CRITERIA INDICATED.

6. DETAILING AND ERECTION OF OPEN WEB STEEL JOISTS SHALL COMPLY WITH OSHA REQUIREMENTS.

7. STEEL ROOF JOISTS SHALL BE PROVIDED WITH NO CAMBER.

8. DESIGN ALL JOISTS (K, KCS, LH) FOR A 500 POUND CONCENTRATED "ADD-LOAD" AT ANY ONE PANEL POINT ALONG THE JOIST, UNLESS NOTED OTHERWISE.

9. K-SERIES JOISTS SHALL BE DESIGNED FOR ADDITIONAL BENDING STRESSES RESULTING FROM A 200 POUND CONCENTRATED "BEND-CHECK" LOAD LOCATED AT ANY LOCATION ALONG TOP AND BOTTOM CHORD IN ADDITION TO ALL OTHER LOADS.

10. KCS AND LH SERIES JOISTS SHALL BE DESIGNED FOR ADDITIONAL BENDING STRESSES RESULTING FROM A 500 POUND CONCENTRATED "BEND-CHECK" LOAD LOCATED AT ANY LOCATION ALONG TOP AND BOTTOM CHORD IN ADDITION TO ALL OTHER LOADS.

11. REFER TO "TYPICAL LOAD SUPPORTED FROM JOIST" DETAIL FOR REQUIREMENTS REGARDING PIPE HANGERS AND OTHER EQUIPMENT LOADS.

12. STEEL JOISTS EXPOSED TO WEATHER IN THE FINISHED WORK SHALL BE PAINTED WITH A ZINC RICH TINEMEC PAINT THAT MEETS THE REQUIREMENTS OF ASTM D 520 TYPE III.

13. COORDINATE SUPPORT OF SPRINKLER PIPING, INCLUDING MAINS, WITH JOIST MANUFACTURER. SPRINKLER MANUFACTURER SHALL OBTAIN A LETTER FROM THE JOIST MANUFACTURER VERIFYING THAT THE PIPE HANGER LOCATION AND LOADS HAVE BEEN PROVIDED FOR THEIR USE. THIS LETTER SHALL BE SUBMITTED TO THE ARCHITECT WITH THE SPRINKLER SUBMITTAL PACKAGE. IF LOCATIONS OF THE MAINS ARE ALTERED FROM THE INFORMATION PROVIDED BY THE SPRINKLER MANUFACTURER TO THE JOIST MANUFACTURER, ADDITIONAL FRAMING SHALL BE ADDED TO PROVIDE ADEQUATE SUPPORT FOR THE PIPING LOADS AT NO COST TO THE OWNER.

FLOWABLE FILL

1. CONTROLLED LOW STRENGTH MATERIAL (CLSM), ALSO REFERRED TO AS FLOWABLE FILL, MAY BE SUBMITTED FOR APPROVAL AS A SUBSTITUTE FOR COMPACTED FILL AT FOUNDATION UNDERCUT LOCATIONS. THE CLSM MIXTURE SHALL BE PROPORTIONED TO PRODUCE AN UNCONFINED COMPRESSIVE STRENGTH OF 100 PSI MINIMUM TO 300 PSI MAXIMUM.

RENOVATION

1. EXISTING CONSTRUCTION INDICATED ON THE STRUCTURAL DRAWINGS IS BASED ON INFORMATION OBTAINED FROM LIMITED VISUAL OBSERVATIONS OF EXISTING CONDITIONS. EXISTING BUILDING CONSTRUCTION DRAWINGS WERE NOT MADE AVAILABLE FROM THE OWNER. THE EXISTING BUILDING REMAINS OCCUPIED AND ABOVE OR BELOW GRADE DESTRUCTIVE TESTING WAS NOT PERFORMED. THEREFORE, THE DRAWING INFORMATION, INCLUDING STRUCTURAL COMPONENT TYPE, SIZE AND ORIENTATION HAS NOT BEEN CONFIRMED IN MOST CASES, AND MAY NOT MATCH "AS-BUILT" EXISTING CONSTRUCTION. ALL EXISTING CONDITIONS AND DIMENSIONS RELATING TO THE NEW WORK SHALL BE VERIFIED BY THE PRIOR TO FABRICATION AND CONSTRUCTION OF STRUCTURAL ELEMENTS. DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

2. EXISTING CONSTRUCTION IS INDICATED USING A LIGHTER LINE WEIGHT THAN NEW CONSTRUCTION IN PLANS AND SECTIONS.

STEEL DECK

1. ALL STEEL DECK WORK SHALL CONFORM TO THE LATEST EDITION OF THE STEEL DECK INSTITUTE (SDI) "DESIGN MANUAL FOR COMPOSITE DECKS, FORM DECKS AND ROOF DECKS", AND AMERICAN IRON AND STEEL INSTITUTE (AISI) "SPECIFICATION FOR THE DESIGN OF COLD FORMED STEEL STRUCTURAL MEMBERS".

2. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.3, "STRUCTURAL WELDING CODE - SHEET STEEL".

3. PERMANENT LOADS SHALL NOT BE SUSPENDED FROM STEEL ROOF DECK UNLESS APPROVED BY ENGINEER OF RECORD.

4. STEEL DECK UP TO 2" DEEP SHALL BE INSTALLED WITH A MINIMUM OF 3 CONTINUOUS SPANS, UNLESS NOTED OTHERWISE. STEEL DECK 3" DEEP OR GREATER SHALL BE INSTALLED WITH A MINIMUM OF 2 CONTINUOUS SPANS, UNLESS NOTED OTHERWISE. ANY LOCATIONS NOT MEETING THESE CONDITIONS SHALL BE SPECIFICALLY IDENTIFIED ON THE STEEL DECK SHOP DRAWINGS.

5. REFER TO "STEEL DECK SCHEDULE" FOR DECK TYPES AND FASTENING REQUIREMENTS.

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL WORK SHALL CONFORM TO THE FOLLOWING AISC DOCUMENTS:
   AISC 360 "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS"
   AISC 303 "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES"
   RCSC'S "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH STRENGTH BOLTS"

2. STRUCTURAL STEEL SHALL COMPLY WITH THE FOLLOWING SPECIFICATIONS:

WIDE FLANGE SHAPES, CHANNELS AND MISC CHANNELS	ASTM A992 (FY=50 KSI)
ANGLES, S-SHAPES AND M-SHAPES	ASTM A572 (FY=50 KSI)
PLATES & BARS (TO 4" THICK)	ASTM A572 (FY=50 KSI)
PLATES & BARS (OVER 4" THICK)	ASTM A36 (FY=32 KSI)
HP SHAPES	ASTM A572 (FY=50 KSI)
HOLLOW STRUCTURAL SECTIONS (HSS)	
SQUARE & RECTANGLE	ASTM A500, GRADE C (FY=50 KSI)
ROUND	ASTM A500, GRADE C (FY=50 KSI)
HIGH STRENGTH BOLTS (CONVENTIONAL)	ASTM F3125, GRADE A325 OR A490 (TYPE 1)
WASHERS	ASTM F436 (FLAT AND BEVELED)
HEAVY HEX NUTS	ASTM A563
TWIST OFF TENSION CONTROL BOLTS	ASTM F3125, GRADE F1852 OR F2280 (TYPE 1)
COMPRESSIBLE-WASHER DIRECT-TENSION INDICATORS	ASTM F959 (TYPE 325 OR 490)
ANCHOR RODS	ASTM F1554, GRADE 55 INCLUDE SUPPLEMENT S1
WELDING ELECTRODES	E70 (LOW HYDROGEN)
HEADED SHEAR STUDS	AWS D1.1 CLAUSE 9, TYPE B (FY=51 KSI)
THREADED ROD	ASTM A36
CLEVISES	AISI C-1035, ASTM A668, CLASS A
TURNBUCKLES	AISI C-1035, ASTM A668, CLASS C
RAISED-PATTERN FLOOR PLATES	ASTM A786, COMMERCIAL GRADE
SHEET & STRIP	ASTM A606, A1008 OR A1011

3. UNLESS NOTED OTHERWISE, CONNECTIONS SHALL BE DESIGNED IN ACCORDANCE WITH AISC MANUAL OF STEEL CONSTRUCTION, AS SIMPLE CONNECTIONS USING ALLOWABLE STRENGTH DESIGN (ASD). CONNECTIONS FOR NON-COMPOSITE BE

SCHEDULE OF SPECIAL INSPECTIONS - 2021 IBC

Inspections Agents					
1. Special Inspector of Record (SIOR): PROCURED BY TOWN AT LATER DATE					
2. Structural Engineer of Record (SEOR): MOSELEY					
3. Steel Fabricator's Quality Control Inspector: PROCURED BY TOWN AT LATER DATE					
4. Structural Observer: MOSELEY					
Abbreviations Legend					
O - Observe - The inspector shall observe these items on a random basis.					
P - Perform - These tasks shall be performed for each welded or bolted joint.					
D - Document - The inspector shall prepare reports indicating that the work has been performed in accordance with the contract documents.					
1704.2.4 Report Requirement					
Special inspector to keep record of special inspections and furnish inspection reports to the building official and to the Registered Design Professional in responsible charge.	●		Y	IBC 1704.2.4	1
1704.2.5 Inspection of Fabricated Items					
Work done in fabricator shop requires inspection unless the fabricator is registered and approved in accordance with 1704.2.5.1. Where fabricator is approved, provide fabricator certification document.		●	Y	1704.2.5	1, 3
At completion of fabrication, submit certificate of compliance to building official stating the work was performed in accordance with the approved construction documents.		●	Y	1704.2.5.1	1
1704.4 Contractor Responsibility					
Each contractor responsible for the construction of a main wind- or seismic force resisting system, designated seismic system or a wind- or seismic-resisting component listed in the statement of special inspections shall submit a written statement of responsibility.		●	N	1704.4	
1704.5 Submittals to the Building Official					
Certificates of compliance for the fabrication of structural, load-bearing or lateral load-resisting members or assemblies on the premises of a registered and approval fabricator in accordance with Section 1704.2.5.1	●		Y	1704.5 1704.2.5.1	2, 3
Certificates of compliance for the seismic qualification of nonstructural components, supports and attachments in accordance with Section 1705.14.2	●		N	1704.5 1705.14.2	2, 3
Certificates of compliance for designated seismic systems in accordance with Section 1705.14.3	●		N	1704.5 1705.14.3	2, 3
Reports of preconstruction tests for shotcrete in accordance with ACI 318	●		N	1704.5, ACI 318	1, 2
Certificates of compliance for open web steel joist and joist girders in accordance with Section 2207.5	●		Y	1704.5, 2207.5	2, 3
Reports of material properties verifying compliance with the requirements of AWS D1.4 for weldability as specified in Section 26.6.4. of ACI 318 for reinforcing bar in concrete complying with a standard other than ASTM A 706 that are to welded	●		N	1704.5, AWS D1.4 26.6.4 of ACI 318 ASTM A 706	1, 2
Reports of mill tests in accordance with Section 20.2.2.5 of ACI 318 for reinforcing bars complying with ASTM A 615 and used to resist earthquake-induced flexural or axial forces in the special moment frames, special structural walls or coupling beams connecting special structural walls of seismic force-resisting systems in structures assigned to Seismic Design Category B, C, D, E, or F.	●		N	1704.5 20.2.2.5 of ACI 318 ASTM A 615	2, 3
1704.6 Structural Observation					
The owner shall employ a registered design professional to perform structural observation. Prior to commencement of observation, the structural observer shall submit to the building official a written statement identifying frequency and extent of structural observations. At the conclusion of the work included in the permit, the structural observer shall submit to the building official a written statement that the site visits have been made and identify any reported deficiencies that, to the best of the structural observer's knowledge, have not been resolved.		●	N	1704.6	4
1705.2 Steel Construction					
Structural steel inspections and non-destructive testing shall be in accordance with the quality assurance inspection requirements of AISC 360				1705.2.1, AISC 360	
QC inspection tasks shall be performed by fabricator's or erectors QCI (Agent 3), as applicable, in accordance with sections N5.4, N5.6, and N5.7. QA inspection tasks shall be performed by the QAI (Agent 1), in accordance with section N5.4, N5.6, and N5.7.				AISC 360	QC	QA
Prior to Welding (AISC 360 Table N5.4-1)				AISC 360 Table N5.4-1		
Welder qualification records and continuity records.					P	O
Welding procedure specifications (WPSs) available					P	P
Manufacturer certifications for welding consumables					P	P
Material identification (type/grade)					O	O
Welder identification system					O	O
Fit-up of groove welds (including joint geometry)					O	O
a. Joint preparation						
b. Dimensions (Alignment, root open, root face, bevel)						
c. Cleanliness (Condition of steel surfaces)						
d. Tacking (tack weld quality and location)						
e. Backing type and fit (if applicable)						
Configuration and finish of access holes					O	O
Fit-up of fillet welds					O	O
a. Dimensions (Alignment, gaps at root)						
b. Cleanliness (Condition of steel surfaces)						
c. Tacking (tack weld quality and location)						
Check welding equipment					O	--
During Welding (AISC 360 Table N5.4-2)				AISC 360 Table N5.4-2		
Control and handling of welding consumables					O	O
a. Packaging						
b. Exposure control						
No welding over cracked tack welds					O	O
Environmental conditions					O	O
a. Wind speed within limits						
b. Precipitation and temperature						
WPS followed					O	O
a. Settings on welding equipment						
b. Travel speed						
c. Selected welding materials						
d. Shielding gas type/flow rate						
e. Preheat applied						
f. Interpass temperature maintained (min/max)						
g. Proper position (F, V, H, OH)						
Welding techniques					O	O
a. Interpass and final cleaning						
b. Each pass with profile limitations						
c. Each pass meets quality requirements						
Placement and installation of steel headed stud anchors					P	P
After Welding (AISC 360 Table N5.4-3)				AISC 360 Table N5.4-3		
Welds cleaned					O	O
Size, length, and location of welds					P	P
Welds meet visual acceptance criteria					P	P
a. Crack prohibition						
b. Weld/base-metal fusion						
c. Crater cross section						
d. Weld profiles						
e. Weld size						
f. Undercut						
g. Porosity						
Arc strikes					P	P
k-area					P	P
Weld access holes in rolled heavy shapes and built-up heavy shapes					P	P
Backing removed and weld tabs removed (if required)					P	P
Repair activities					P	P
Document acceptance or rejection of welded joint or member					P	P
No prohibited welds have been added without the approval of the EOR					O	O

Inspections & Testing	Reference Standard or Compliance Document	Agent	
Nondestructive Testing of Welded Joints (AISC 360 Section N5.5)	AISC 360 Section N5.5	QC	QA
Risk Category II Structures - Perform Ultrasonic Testing on 10% of CJP groove welds in butt, T- and corner joints subject to transversely applied tension loading, in materials 5/16 inches thick or greater.			P
Risk Category III or IV Structures - Perform Ultrasonic Testing on all CJP groove welds subject to transversely applied tension loading in butt, T- and corner joints subject to transversely applied tension loading, in materials 5/16 inches thick or greater.			P
Welded Joints Subject to Fatigue			P
Prior to Welding (AISC 341 Table J6.1)	AISC 341 Table J6.1		
Visual inspection tasks prior to welding			
Material identification (Type/Grade)		O	O
Welder identification system		O	O
Fit-up of Groove Welds (including joint geometry) - Joint preparation - Dimensions (alignment, root opening, root face, bevel) - Cleanliness (condition of steel surfaces) - Tacking (tack weld quality and location) - Backing type and fit (if applicable)		P/O**	O
Configuration and finish of access holes		O	O
Fit-up of Fillet Welds - Dimensions (alignment, gaps at root) - Cleanliness (condition of steel surfaces) - Tacking (tack weld quality and location)		P/O**	O
During Welding (AISC 341 Table J6.2)	AISC 341 Table J6.2		
Visual inspection tasks during welding			
WPS followed - Settings on welding equipment - Travel speed - Selected welding materials - Shielding gas type/flow rate - Preheat applied - Interpass temperature maintained (min/max) - Proper position (F, V, H, OH) - Intermix of filler metals avoided unless approved		O	O
Use of qualified welders		O	O
Control and handling of welding consumables - Packaging - Exposure control		O	O
Environmental conditions - Wind speed within limits - Precipitation and temperature		O	O
Welding techniques - Interpass and final cleaning - Each pass within profile limitations - Each pass meets quality requirements		O	O
No welding over cracked tacks		O	O
After Welding (AISC 341 Table J6.3)	AISC 341 Table J6.3		
Visual inspection tasks after welding			
Welds cleaned		O	O
Size, length and location of welds		P	P
Welds meet visual acceptance criteria - Crack prohibition - Weld/base-metal fusion - Crater cross section - Weld profiles and size - Undercut - Porosity		P, D	P, D
"k-area		P, D	P, D
Placement of reinforcing or contouring fillet welds (if required)		P, D	P, D
Backing removed, weld tabs removed and finished, and fillet welds added (if required)		P, D	P, D
Repair activities		P	P, D

* When welding doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect web k-area for cracks within 3 in. (75 mm) of the weld. The visual inspection shall be performed no sooner than 48 hours following completion of the welding

Inspections & Testing	Reference Standard or Compliance Document	Agent	
Inspection Tasks Prior to Bolting (AISC 360 Table N5.6-1)	AISC 360 Section N5.6-1		
Manufacturer's certifications available for fastener materials		O	P
Fasteners marked in accordance with ASTM requirements		O	O
Correct fasteners selected for the joint detail (grade, type, bolt length if threads are to excluded for shear plane)		O	O
Correct bolting pattern selected for joint detail		O	O
Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements		O	O
Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used (Not required for snug tight bolts)		P	O
Protected storage provided for bolts, nuts, washers and other fastener components		O	O
Inspection Tasks During Bolting (AISC 360 Table N5-6.2)	AISC 360 Section N5.6-2		
These inspections are not required for snug-tight joints. These inspections are not required for pretensioned joints and slip-critical joints, when the installer is using the turn-of-nut method with matchmarking techniques, the direct-tension-indicator method, or the twist-off-type tension control bolt method.			
Fastener assemblies placed in all holes and washers and nuts are positioned as required		O	O
Joint brought to the snug-tight condition prior to pretensioning operation		O	O
Fastener component not turned by the wrench prevented from rotating		O	O
Fasteners are pretensioned in accordance with the RCSC specification, progressing systematically from the most rigid point toward the free edges		O	O
Inspection Tasks After Bolting (AISC 360 Table N5.6-3)	AISC 360 Table N5.6-3		
Document acceptance or rejection of bolted connections		P	P
Other Inspection Tasks (AISC 360 Section N5.8)	AISC 360 Section N5.8		
Verify compliance of fabricated steel with the details shown on the shop drawings		P	--
Verify compliance of the erected steel frame with the field installed details shown on the erection drawings including braces, stiffeners, member location and joint details		P	--
Anchor rods and other embedment supporting structural steel for compliance with the construction documents			
a. Verify the diameter, grade, type and length of the anchor rod or embedded item		--	P
b. Verify the extent or depth of embedment into the concrete		--	P
RBS requirements, if applicable (ref: AISC 341)	AISC 341 Table J8.1		
a. Contour and finish		P/D	P/D
b. Dimensional tolerances		P/D	P/D
Protected zone - no holes and unapproved attachments made by fabricator or erector, as applicable (ref: AISC 341)	AISC 341 Table J8.1	P/D	P/D
H-Piles - Protected zone - no holes and unapproved attachments made by the responsible contractor, as applicable (ref: AISC 341)	AISC 341 Table J10.1	P/D	P/D

Inspections & Testing	Continuous	Periodic	Y / N	Reference Standard or Compliance Document	Agent
1705.2.2 Cold-Formed Steel Deck					
Special inspections and qualifications of welding special inspectors for cold-formed steel floor and roof deck shall be in accordance with the quality assurance inspection requirements of SDI QA/QC		●	Y	1705.2.2	2
1705.2.3 Open-Web Steel Joists and Joist Girders					
Installation of open-web steel joists and joist girders		●	Y	The design, manufacture and use of open web steel joists and joist girders shall be in accordance with either SJI 100 or SJI 200, as applicable	1
a. End connections - welding or bolted					
b. Bridging - horizontal or diagonal					
i. Standard bridging					
ii. Bridging that differs from the SJI specifications listed in section 2207.1					

Inspections & Testing	Continuous	Periodic	Y / N	Reference Standard or Compliance Document	Agent
1705.2.4 Cold-Formed Steel Trusses Spanning 60 Feet or Greater					
Verify temporary installation restraint/bracing installed in accordance with the approved shop drawings.		●	N	1705.2.4	2
Verify permanent individual truss member restraint/bracing installed in accordance with the approved shop drawings.		●	N		2
Inspection of Composite Structures					
Prior to Concrete Placement (AISC 341 Table J9.1)				AISC 341 Table J9.1	QC	QA
Material identification of reinforcing steel (Type/Grade)		●	N		O	O
Determination of carbon equivalent for reinforcing steel other than ASTM A706		●	N		O	O
Proper reinforcing steel size, spacing and orientation		●	N		O	O
Reinforcing steel has not been rebent in the field		●	N		O	O
Reinforcing steel has been tied and supported as required		●	N		O	O
Required reinforcing steel clearances have been provided		●	N		O	O
Composite member has required size		●	N		O	O
During Concrete Placement (AISC 341 Table J9.2)				AISC 341 Table J9.2		
Concrete: Material identification (mix design, compressive strength, maximum large aggregate size, maximum slump)		●	N		O, D	O, D
Limits on water added at the truck or pump		●	N		O, D	O, D
Proper placement techniques to limit segregation		●	N		O	O
After Concrete Placement (AISC 341 Table J9.3)				AISC 341 Table J9.3		
Achievement of minimum specified concrete compressive strength at specified age		●	N		D	D
1705.3 Concrete Construction						
Inspect reinforcing steel, including prestressing tendons, and verify placement.		●	Y	ACI 318: CH. 20, 25.2, 25.3, 26.6.1 - 26.6.3	1
Inspect reinforcing bar welding:				AWS D1.4 ACI 318: 26.6.4	1
a. Verify weldability of reinforcing bars other than ASTM A706		●	Y		
b. Inspect single pass fillet welds, maximum 5/16"		●	Y		
c. Inspect all welds	●		Y		
Inspect anchors cast in concrete		●	Y	ACI 318: 17.8.2	1
Inspect anchors post-installed in hardened concrete members:					1
a. Adhesive anchors installed in horizontally or upwardly inclined orientation to resist sustained tension loads.	●		Y	ACI 318: 17.8.2.4	
b. Mechanical anchors and adhesive anchors not defined above		●	Y	ACI 318: 17.8.2	
Verify use of approved design mix		●	Y	ACI 318: CH. 19, 26.4.3, 26.4.4	1
Prior to placement fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete	●		Y	ASTM C31, ASTM C172, ACI 318: 26.5, 26.12	1
Inspect concrete and shotcrete placement for proper application techniques	●		Y	ACI 318: 26.5	1
Verify maintenance of specified curing temperature and techniques		●	Y	ACI 318: 26.5.3 - 26.5.5	1
Inspect prestressed concrete for:					1
a. Application of prestressing forces	●		N	ACI 318: 26.10	
b. Grouting of bonded prestressing tendons in the seismic-force-resisting system					
Inspect erection of precast structural members		●	N	ACI 318: 26.9	1
Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5		●	N	ACI 318: 26.13.1.3	1
Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs		●	N	ACI 318: 26.11.2	1
Inspect formwork for shape, location and dimensions of the concrete member being formed		●	Y	ACI 318: 26.11.1.2(b)	1

Inspections & Testing	Required for Quality Assurance[a]			Reference for Criteria	
	Level 1	Level 2	Level 3	TMS 402	TMS 602
1705.4 Masonry Construction - All tasks within this section by Agent 1					
Minimum Verification					
Prior to construction, verification of compliance of submittals	R	R	R		Art. 1.5
Prior to construction, verification of f'_m and f'_{AAC}, except where specifically exempted by the Code	NR	R	R		Art. 1.4 B
During construction, verification of Slump flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to the project site	NR	R	R		Art. 1.5, 1.6.3
During construction, verification of f'_m and f'_{AAC}, for every 5,000 sq.ft. (465 sq. m)	NR	NR	R		Art. 1.4 B
During construction, verification of proportions of materials as delivered to the project site for premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout.	NR	NR	R		Art. 1.4 B

Inspection Task	Frequency[a]			Reference for Criteria	
	Level 1	Level 2	Level 3	TMS 402	TMS 602
1. As masonry construction begins, verify that the following are in compliance					
a. Proportions of site-prepared mortar	NR	P	P		Art. 2.1, 2.6 A & 2.6 C
b. Grade and size of prestressing tendons and anchorages	NR	P	P		Art. 2.4 B & 2.4 H
c. Grade, type and size of reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages	NR	P	P		Art. 3.4 & 3.6 A
d. Prestressing technique	NR	P	P		Art. 3.6 B
e. Properties of thin-bed mortar for AAC masonry	NR	C[b],[c]	C		Art. 2.1 C.1
f. Sample panel construction	NR	P	C		Art. 1.6 D
2. Prior to grouting, verify that the following are in compliance					
a. Grout space	NR	P	C		Art. 3.2 D & 3.2 F
b. Placement of prestressing tendons and anchorages	NR	P	P	Sec. 10.8 & 10.9	Art. 2.4 & 3.6
c. Placement of reinforcement, connectors, and anchor bolts	NR	P	C	Sec. 6.1, 6.3.1, 6.3.6, & 6.3.7	Art. 3.2 E & 3.4
d. Proportions of site-prepared grout and prestressing grout for bonded tendons	NR	P	P		Art. 2.6 B & 2.4 G.1.b
3. Verify compliance for the following during construction:					
a. Materials and procedures with the approved submittals	NR	P	P		Art. 1.5
b. Placement of masonry units and mortar joint construction	NR	P	P		Art. 3.3 B
c. Size and location of structural members	NR	P	P		Art. 3.3 F
d. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction	NR	P	C	Sec. 1.2.1(e), 6.2.1, & 6.3.1	
e. Welding of reinforcement	NR	C	C	Sec. 6.1.6.1.2	
f. Preparation, construction, and protection of masonry during: cold weather (temperature below 40°F (4.4°C)) or hot weather (temperature above 90°F (32.2°C))	NR	P	P		Art. 1.8 C & 1.8 D
g. Application and measurement of prestressing force	NR	C	C		Art. 3.6 B
h. Placement of grout and prestressing grout for bonded tendons is in compliance	NR	C	C		Art. 3.5 & 3.6 C
i. Placement of AAC masonry units and construction of thin-bed mortar joints	NR	C[b],[c]	C		Art. 3.3 B.9 & 3.3.F.1.b
4. Observe preparation of grout specimens, mortar specimens, and/or prisms	NR	P	C		Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, & 1.4 B.4

(a) Frequency refers to the frequency of inspection, which may be continuous during the listed task or periodically during the listed task, as defined in the table.
R = Required, NR = Not Required, P = Periodic, C = Continuous
(b) Required for the first 5,000 Sq. Ft. (465 Sq. M.) of AAC masonry
(c) Required after the first 5,000 Sq. Ft. (465 Sq. M.) of AAC masonry

Inspections & Testing	Continuous	Periodic	Y / N	Reference Standard or Compliance Document	Agent
1705.6 Soils					
Verify materials below shallow foundations are adequate to achieve the required bearing capacity		●	Y	Table 1705.6	1
Verify excavations are extended to proper depth and have reached proper material		●	Y		1
Perform classification and testing of compacted fill materials		●	Y		1
During fill placement, verify use of proper materials and procedures in accordance with the provisions of the approved geotechnical report. Verify densities and lift thicknesses during placement and compaction of compacted fill	●		Y		1
Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly		●	Y		1
1705.7 Driven Deep Foundation Elements					
Verify element materials, sizes and lengths comply with the requirements	●		N	Table 1705.7	1
Determine capacities of test elements and conduct additional load tests when required. Refer to project specifications	●		N		1
Maintain complete and accurate records for each element	●		N		1
Observe and verify drilling operations	●		N		1
a. Verify element locations and plumbness					
b. Verify type and size of hammer					
c. Record number of blows per foot of penetration					
d. Determine required penetration to achieve specified capacity					
e. Record pile tip and butt elevations					
f. Document any damage to any foundation element					
For steel elements, perform additional inspection in accordance with 1705.2 and AISC 341, Table J10-1			N	Section 1705.2	1
For concrete elements and concrete-filled elements, perform additional inspections in accordance with 1705.3			N	Section 1705.3	1
For specialty elements, perform additional inspections as required in the project specifications.			N	Statement of Special Inspections	1
1705.8 Cast-In-Place Deep Foundations					
Maintain complete and accurate records for each element	●		N	Table 1705.8	1
Observe and verify drilling operations	●		N		1
a. Verify element locations and plumbness					
b. Verify element diameter					
c. Verify bell diameter (if applicable)					
d. Verify element lengths					
e. Verify embedment depth into bedrock (if applicable)					
f. Verify adequate end-bearing strata capacity					
g. Record concrete or grout volumes					
For concrete elements, perform additional inspections in accordance with 1705.3			N	1705.3	1
1705.9 Helical Piles					
Maintain complete and accurate records for each element	●		N	Table 1705.9	1
Observe and verify drilling operations	●		N		1
a. Verify installation equipment used					
b. Verify pile locations					
c. Verify pile dimensions					
d. Verify tip elevations					
e. Verify final depth					
f. Verify final installation torque					
g. Other data as required by the project specifications					
1705.12 Special Inspections for Wind Resistance					
Provide inspections when required by 1705.12					1, 2
a. Structural wood	●		N	1705.12.1	
b. CFS light frame construction		●	N	1705.12.2	
c. Wind resisting components		●	N	1705.12.3	
1705.13 Special Inspections for Seismic Resistance					
Maintain complete and accurate records for each element		●	N		1, 2
a. Structural steel				1705.13.1	
b. Structural wood				1705.13.2	
c. CFS light frame construction (CFSF)				1705.13.3	
d. Designated seismic systems				1705.13.4	
e. Architectural components				1705.13.5	
f. Plumbing, Mechanical, Electrical components				1705.13.6	
g. Storage racks				1705.13.7	
1705.14 Testing for Seismic Resistance					
Test and qualify seismic resistance in accordance with 1705.14 and the project specifications		●	N	1705.14	1, 2
1705.15 Sprayed Fire-Resistant Materials (SFRM)					
Inspect sprayed fire-resistant materials in accordance with 1705.15 and the project specifications		●	N	1705.15	1
a. Condition of substrate					
b. Thickness of application					
c. Density					
d. Bond strength adhesion/cohesion					
e. Condition of finished application					
1705.16 Mastic and Intumescent Fire-Resistant Coatings					
Perform inspections in accordance with AWCI 12-B and 1705.16		●	N	AWCI 12-B	1
1705.17 Exterior Insulation and Finish Systems (EIFS)					
Perform inspections in accordance with project specifications and 1705.17		●	N	1705.17	1
1705.18 Fire-resistant Penetrations and Joints (section not applicable in the State of Virginia)					
Perform inspections in accordance with project specifications and 1705.18		●	N	1705.18.1, 1705.18.2	1, 2
1705.19 Smoke Control					
Perform testing in accordance with project specifications and 1705.19.1		●	N	1705.19	1

Cold-Formed Steel Construction (Refer to AISI S240) - All tasks within this section by Agent 1				
Table D6.6-1 Material Verification Tasks Prior to Assembly or Installation		QC	QA
A	Verify compliance of cold-formed steel structural members: - Product identification (Section A5.5)	P	
B	Verify compliance of connectors	P	
C	Document acceptance or rejection of cold-formed steel structural members and connectors	--	
Table D6.6-2 Material Verification Tasks After Assembly or Installation		QC	QA
A	Verify compliance of cold-formed steel structural members: - Product identification (Section A5.5)	P	
B	Verify compliance of connectors	P	
C	Document acceptance or rejection of cold-formed steel structural members and connectors	--	
Table D6.7-1 Inspection or Execution Tasks Prior to Welding		QC	QA
A	Welding procedure specifications available	O	
B	Manufacturer certifications for welding consumables available	O	
C	Material identification (type/grade)	O	
D	Check welding equipment	O	
Table D6.7-2 Inspection or Execution Tasks During Welding		QC	QA
A	Use of qualified welders	O	O
B	Control and handling of welding consumables	O	
C	Environmental conditions (wind speed, moisture, temperature)	O	
D	Welding procedure specifications followed	O	
Table D6.7-3 Inspection or Execution Tasks After Welding		QC	QA
A	Verify compliance of welds	P	P
B	Welds meet visual acceptance criteria	P	P
C	Verify repair activities	P	P
D	Document acceptance or rejection of welded connections	--	P
Table D6.8-1 Inspection or Execution Tasks Prior to Mechanical Fastening		QC	QA
A	Mechanical fastener manufacturer installation instructions available for mechanical fasteners	O	
B	Proper tools available for mechanical fastener installation	O	
C	Proper storage for mechanical fasteners	O	
Table D6.8-2 Inspection or Execution Tasks During Mechanical Fastening		QC	QA
A	Mechanical fasteners are positioned as required	O	
B	Mechanical fasteners are installed in accordance with manufacturer's instructions	O	
Table D6.8-3 Inspection or Execution Tasks After Mechanical Fastening		QC	QA
A	Verify compliance of mechanical fasteners	P	
B	Repair activities	P	
C	Document acceptance or rejection of mechanically fastened connections	--	
Table D6.9-1 Inspection or Execution Tasks After Installation of Cold-Formed Steel Light-Frame Construction		QC	QA
A	Verify compliance of cold-formed steel light-frame construction	P	
B	Document acceptance or rejection of cold-formed steel light-frame construction	--	
Table D6.10-1 Additional Inspection or Execution Tasks Prior to Installation of Cold-Formed Steel Lateral Force-Resisting Systems		QC	QA
A	Verify compliance of shear wall and diaphragm sheathing, diagonal strap bracing, and hold-downs	P	
B	Document acceptance or rejection of shear wall and diaphragm sheathing, diagonal strap bracing, and hold-downs	--	
Table D6.10-2 Additional Inspection or Execution Tasks Prior to Welding of Cold-Formed Steel Lateral Force-Resisting Systems		QC	QA
A	Welder identification system	O	
B	Fit-up of welds (alignment, gaps, condition of steel surfaces)	P/O	
Table D6.10-3 Additional Inspection or Execution Tasks Prior to Mechanical Fastening of Cold-Formed Steel Lateral Force-Resisting Systems		QC	QA
A	Proper fasteners selected	O	
B	Proper installation procedure selected	O	
C	Connecting elements meet applicable requirements	O	
Table D6.10-4 Additional Inspection or Execution Tasks During Mechanical Fastening of Cold-Formed Steel Lateral Force-Resisting Systems		QC	QA
A	For screw connections, joint brought tight (e.g., clamped) to avoid gaps between plies	O	O
B	For screw connections, tool adjusted to avoid stripped and overdriven fasteners	O	O
C	For post-installed connections to concrete, installation in accordance with manufacture's instructions	P	P
Table D6.10-5 Additional Inspection or Execution Tasks After Installation of Cold-Formed Steel Lateral Force-Resisting Systems		QC	QA
A	Verify compliance of cold-formed steel lateral force-resisting system installation	P	O
B	Document acceptance or rejection of installation of cold-formed steel lateral force-resisting system	--	P

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/2026
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

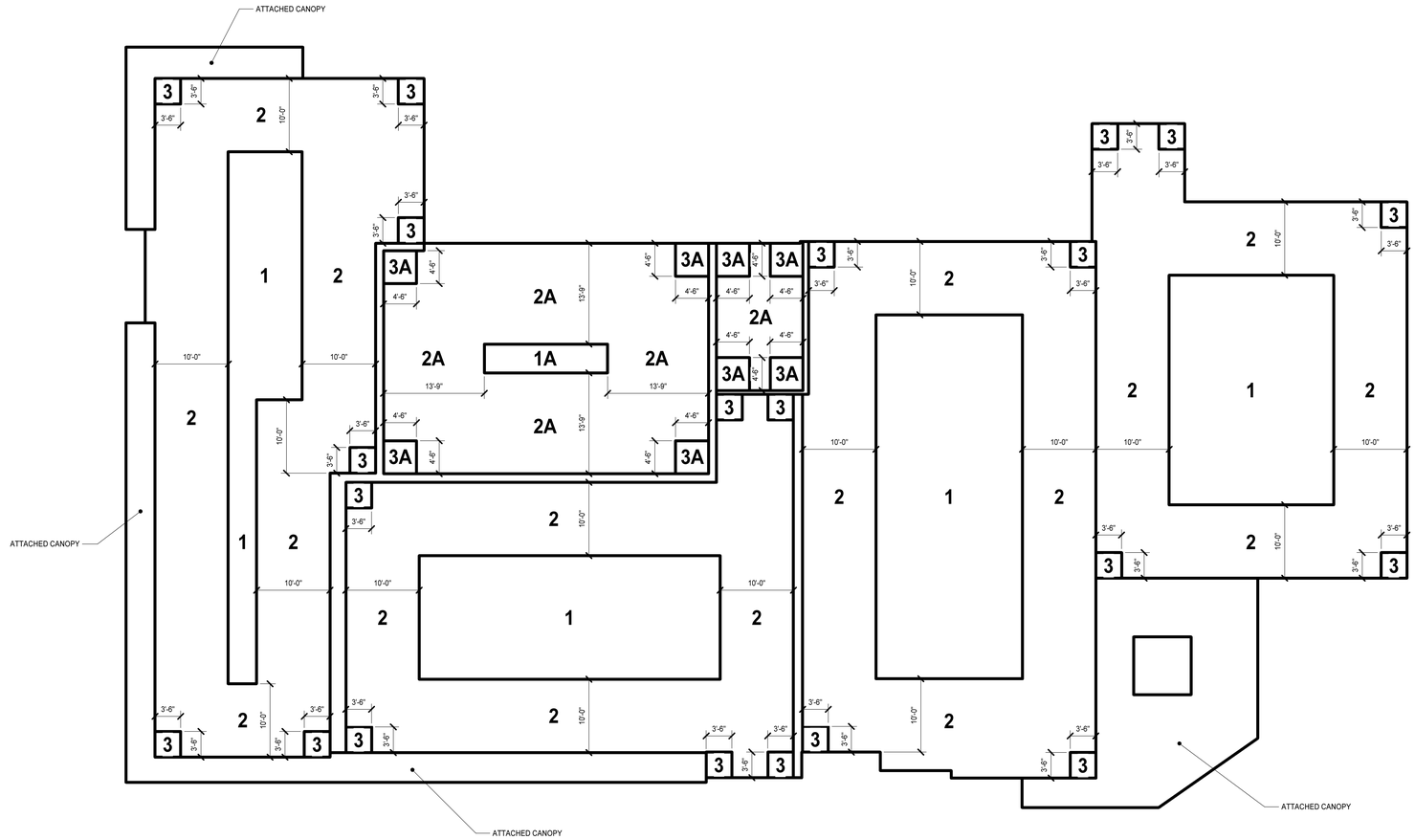
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DATE	DESCRIPTION

SCHEDULE OF SPECIAL INSPECTIONS - 2021 IBC

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WIND PRESSURE DIAGRAM

WIND PRESSURE DIAGRAM NOTES:

1. PRESSURES INDICATED ARE COMPONENT AND CLADDING WIND PRESSURES FOR ALLOWABLE STRESS DESIGN PER ASCE 7.
2. PRESSURES INDICATED ARE ULTIMATE PRESSURES.
3. EFFECTIVE WIND AREAS SHALL BE DETERMINED IN ACCORDANCE WITH ASCE 7.
4. WHEN AREA FALLS BETWEEN THE VALUES IN THE TABLE, LINEAR INTERPOLATION IS PERMITTED.
5. INTERIOR REGIONS OF WALLS ARE ZONE 4 AND CORNER REGIONS OF WALLS ARE ZONE 5.
6. (+) INDICATES PRESSURES ACTING TOWARDS THE ROOF / WALL (INWARDS).
   (-) INDICATES PRESSURES ACTING AWAY FROM THE ROOF / WALL (OUTWARDS).
7. SOFFITS SHALL BE DESIGNED FOR THE CORRESPONDING WALL POSITIVE PRESSURE.

DESIGN WIND PRESSURES - COMPONENTS AND CLADDING (ROOF)

ROOF ZONE	COMPONENT EFFECTIVE WIND AREA (SF)					
	AREA <= 10 SF	AREA = 20 SF	AREA = 50 SF	AREA = 100 SF	AREA = 200 SF	AREA >= 500 SF
1A	+14.8 PSF / -57.8 PSF	+13.2 PSF / -54.8 PSF	+11.7 PSF / -48.6 PSF	+11.7 PSF / -45.5 PSF	+11.7 PSF / -42.5 PSF	+11.7 PSF / -36.3 PSF
2A	+14.8 PSF / -76.3 PSF	+13.2 PSF / -71.7 PSF	+11.7 PSF / -64.0 PSF	+11.7 PSF / -59.4 PSF	+11.7 PSF / -54.8 PSF	+11.7 PSF / -48.6 PSF
3A	+14.8 PSF / -104.00 PSF	+13.2 PSF / -94.8 PSF	+11.7 PSF / -80.7 PSF	+11.7 PSF / -70.2 PSF	+11.7 PSF / -60.9 PSF	+11.7 PSF / -48.6 PSF
1	+13.7 PSF / -53.5 PSF	+12.2 PSF / -50.7 PSF	+10.8 PSF / -45.0 PSF	+10.8 PSF / -42.1 PSF	+10.8 PSF / -39.3 PSF	+10.8 PSF / -33.6 PSF
2	+13.7 PSF / -70.6 PSF	+12.2 PSF / -66.3 PSF	+10.8 PSF / -59.2 PSF	+10.8 PSF / -55.0 PSF	+10.8 PSF / -50.7 PSF	+10.8 PSF / -45.0 PSF
3	+13.7 PSF / -96.2 PSF	+12.2 PSF / -87.7 PSF	+10.8 PSF / -74.9 PSF	+10.8 PSF / -64.9 PSF	+10.8 PSF / -56.4 PSF	+10.8 PSF / -45.0 PSF

DESIGN WIND PRESSURES - COMPONENTS AND CLADDING (WALL)

WALL ZONE	COMPONENT EFFECTIVE WIND AREA (SF)					
	AREA <= 10 SF	AREA = 20 SF	AREA = 50 SF	AREA = 100 SF	AREA = 200 SF	AREA >= 500 SF
4 (2ND FL)	+36.3 PSF / -39.4 PSF	+34.8 PSF / -37.8 PSF	+33.2 PSF / -36.3 PSF	+30.2 PSF / -33.2 PSF	+28.6 PSF / -31.7 PSF	+27.1 PSF / -30.2 PSF
5 (2ND FL)	+36.3 PSF / -48.6 PSF	+34.8 PSF / -45.5 PSF	+33.2 PSF / -40.9 PSF	+30.2 PSF / -37.8 PSF	+28.6 PSF / -33.2 PSF	+27.1 PSF / -30.2 PSF
4 (1ST FL)	+33.6 PSF / -36.4 PSF	+32.2 PSF / -35.0 PSF	+30.8 PSF / -33.6 PSF	+27.9 PSF / -30.8 PSF	+26.5 PSF / -29.3 PSF	+25.1 PSF / -27.9 PSF
5 (1ST FL)	+33.6 PSF / -45.0 PSF	+32.2 PSF / -42.1 PSF	+30.8 PSF / -37.9 PSF	+27.9 PSF / -35.0 PSF	+26.5 PSF / -30.8 PSF	+25.1 PSF / -27.9 PSF

DESIGN WIND PRESSURES - COMPONENTS AND CLADDING (ATTACHED CANOPY)

CANOPY SURFACE	COMPONENT EFFECTIVE WIND AREA (SF)		
	AREA <= 10 SF	AREA = 50 SF	AREA >= 100 SF
UPPER	+22.8 PSF / -32.7 PSF	+21.4 PSF / -25.6 PSF	+17.1 PSF / -21.4 PSF
LOWER	+22.8 PSF / -22.8 PSF	+21.4 PSF / -21.4 PSF	+17.1 PSF / -19.9 PSF

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

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SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

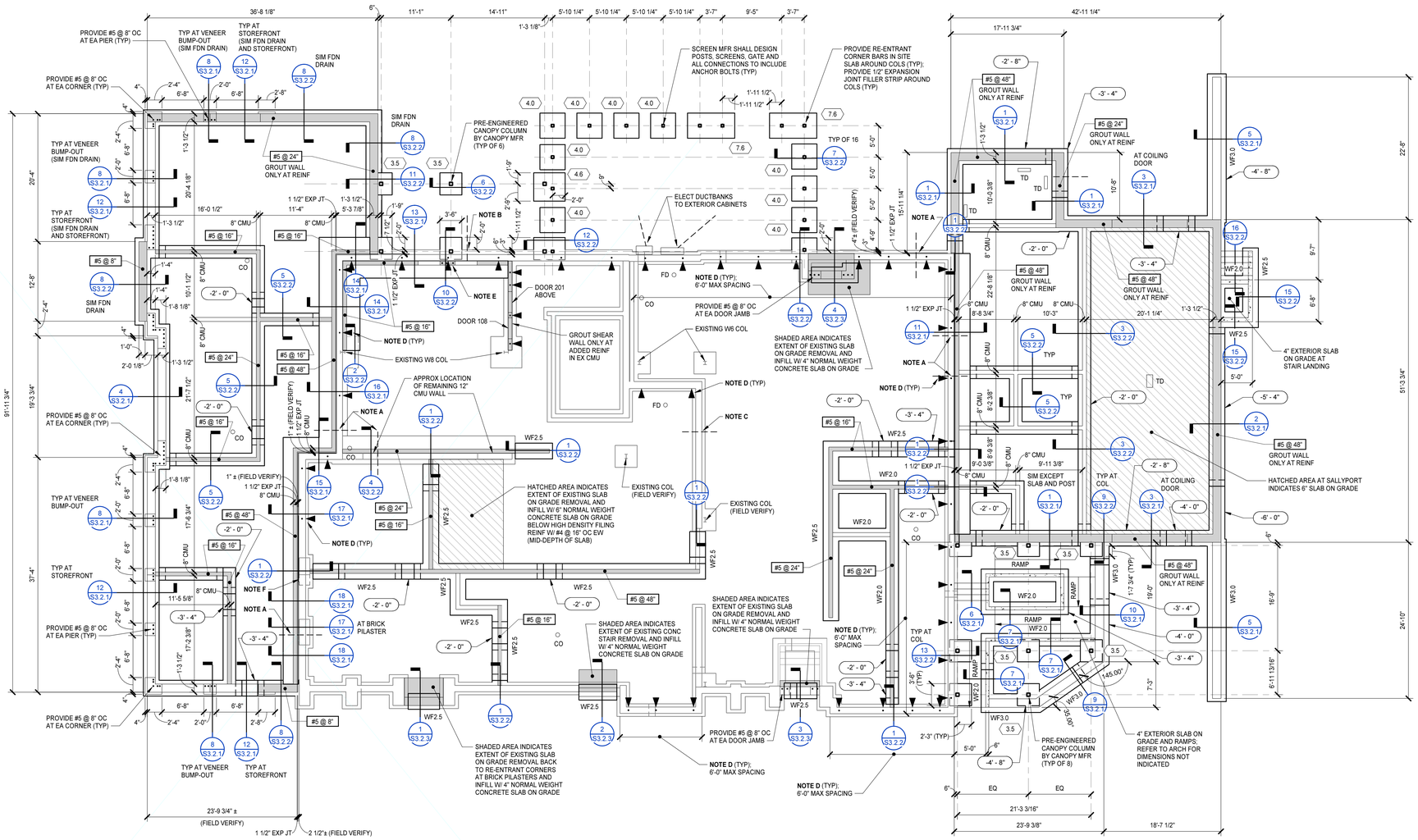
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SUBMITTAL: BID SET

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DATE DESCRIPTION

COMPONENTS AND CLADDING WIND PRESSURES

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FOUNDATION PLAN

1/8" = 1'-0"

FOUNDATION PLAN NOTES:

1. EXISTING FIRST FLOOR ELEVATION IS BASED OFF TRUESCAN REVIT MODEL AND CIVIL SITE PLAN SPOT ELEVATIONS AT EXISTING DOORS = REFERENCE DATUM EL (+0'-0"). ALL STRUCTURAL ELEVATIONS INDICATED ARE REFERENCED FROM THIS ELEVATION, UNO. REFER TO ARCH DRAWING A1.1.3 FOR ELEVATIONS AND NOTES.
2. FLOOR CONSTRUCTION (AND SLAB INFILL) SHALL BE 4" NORMAL WEIGHT CONCRETE SLAB ON GRADE REINFORCED WITH 6x6-W2.9xW2.9 WWF (AT 1" FROM TOP OF SLAB) OVER VAPOR BARRIER OVER 6" GRANULAR BASE COURSE, UNO. SALLYPORT FLOOR CONSTRUCTION (INDICATED HATCHED ON PLAN) SHALL BE A 6" NORMAL WEIGHT CONCRETE SLAB ON GRADE REINFORCED WITH #4 AT 16" OC EACH WAY (MID-DEPTH) OVER VAPOR BARRIER OVER 6" GRANULAR BASE COURSE. EXTERIOR SLAB ON GRADE AND RAMPS SHALL BE 4" NORMAL WEIGHT CONCRETE ON GRADE REINFORCED WITH 6x6-W2.9xW2.9 WWF (AT MID-DEPTH) OVER 4" POROUS FILL.
3. BASE COURSE SHALL BE A CLEAN, DENSELY-GRADED "CRUSHER RUN" MATERIAL WITH A BALANCED FINE CONTENT, SUCH AS VDOT 21A OR 21B STONE. THE BASE COURSE SHALL BE COMPACTED AND SHALL BE FINISHED TO A FLAT, SMOOTH, LOW-FRICTION SURFACE. COMPACTION SHALL BE MONITORED BY THE ON-SITE TESTING AGENCY. OPEN GRADED STONE, SUCH AS #57 STONE, IS NOT ACCEPTABLE.
4. TOP OF ALL INTERIOR FOOTINGS SHALL BE (-0'-8"), UNO. TOP OF ALL EXTERIOR FOOTINGS SHALL BE (-2'-0"), UNO.
5. ALL INTERIOR WALL FOOTINGS SHALL BE WF2.0, UNO. ALL EXTERIOR WALL FOOTINGS SHALL BE WF2.5, UNO.
6. REINFORCE ALL EXTERIOR MASONRY WALLS WITH #5 AT 48" OC FULL WALL HEIGHT WITH EQUAL DOWELS TO FOOTING, UNO. REINFORCE INTERIOR MASONRY WALLS AS INDICATED ON PLAN.
7. COORDINATE FOOTING STEPS WITH ALL UNDERSLAB UTILITIES. REFER TO FOUNDATION NOTE #4 ON DRAWING S0.1.1.
8. REFER TO "RENOVATION" NOTES ON DRAWING S0.1.1 FOR EXISTING CONSTRUCTION.
9. REFER TO ARCH DRAWING A0.3.1 FOR DEMOLITION PLANS. REFER TO "DEMOLITION FIRST FLOOR PLAN" FOR APPROXIMATE EXTENTS OF EXISTING SLAB ON GRADE REMOVAL.
10. WALLS SHADED THUS " ▭ " ARE SHEAR WALLS. SHEAR WALLS SHALL BE GROUTED SOLID (UNO) WITH CONTROL JOINTS AS INDICATED, AND NO CLOSER THAN 30'-0" OC. NO REINFORCING IN THESE WALLS IS ALLOWED TO BE CUT. LOCATE ALL PIPING AND CONDUIT OUTSIDE OF REINFORCED CELLS. TWO VERTICAL BARS, SPACED 8" APART, SHALL BE LOCATED AT EACH END OF THE SHEAR WALL. ALL VERTICAL REINFORCEMENT IS FULL WALL HEIGHT, UNO.
11. REFER TO ARCH DRAWINGS FOR INTERIOR MASONRY WALL DIMENSIONS IN EXISTING BUILDING NOT INDICATED ON PLAN.
12. REFER TO DRAWING S0.1.1 FOR GENERAL NOTES, PLAN LEGEND, AND STRUCTURAL ABBREVIATIONS.
13. REFER TO DRAWINGS S3.1.1 AND S3.1.2 FOR TYPICAL FOUNDATION DETAILS AND SCHEDULES.

NOTE A: VERIFY PLUMBING LINE SHALL PASS ABOVE EXISTING CONCRETE FOOTING. PIPE SLEEVE SHALL BE PLACED THROUGH ADDED CONCRETE ON EXISTING FOOTING THAT SUPPORTS CMU WALL (AS REQUIRED PER SPECIFIC LOCATION). PIPE SLEEVE SHALL NOT INTERRUPT CONTINUOUS CONCRETE REBAR.

NOTE B: COORDINATE ELECTRICAL DUCTBANK BELOW EXISTING CONCRETE FOOTING. REFER TO "UNDERMINED FOOTING DETAIL" ON DWG. S3.1.1.

NOTE C: SAWCUT AND REMOVE 1'-0"± PORTION OF EXISTING FOUNDATION WALL AND CONCRETE FOOTING BELOW ADDED OPENING (LINTEL) TO ALLOW PLUMBING LINE TO PASS THROUGH.

NOTE D: AT LOCATIONS INDICATED THUS " ◄ " ON PLAN, CONTINUOUSLY SAWCUT EXISTING CMU FACE SHELL AT SINGLE CELL FROM EXISTING SLAB ON GRADE TO COURSE BELOW BEARING. A #5 VERT BAR SHALL BE CONTINUOUSLY GROUTED INTO CELL. THIS WALL REINFORCING SHALL BE ADDED AT APPROXIMATE LOCATIONS AS INDICATED ON PLAN, AT MAXIMUM 10'-0" SPACING, EXCEPT AS NOTED OTHERWISE AS 6'-0" OC MAXIMUM. COORDINATE LOCATIONS TO AVOID ALL OPENINGS, CENTERING BETWEEN OPENINGS, AS REQUIRED. AVOID WALL REINFORCING CUTS OCCURRING BELOW EXISTING JOIST BEARING. WALL CUTS AND REINFORCING SHALL BE ADDED PRIOR TO BEARING ADDITIONAL ROOF JOISTS.

NOTE E: GROUT PIER SOLID AND PROVIDE #5 @ 8" OC VERT BARS.

NOTE F: REFER TO SECTION 7/S3.3.5 FOR EXISTING BRICK PILASTER 1'-8" MAX DEMOLITION AND LINTEL REMOVAL.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/25
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

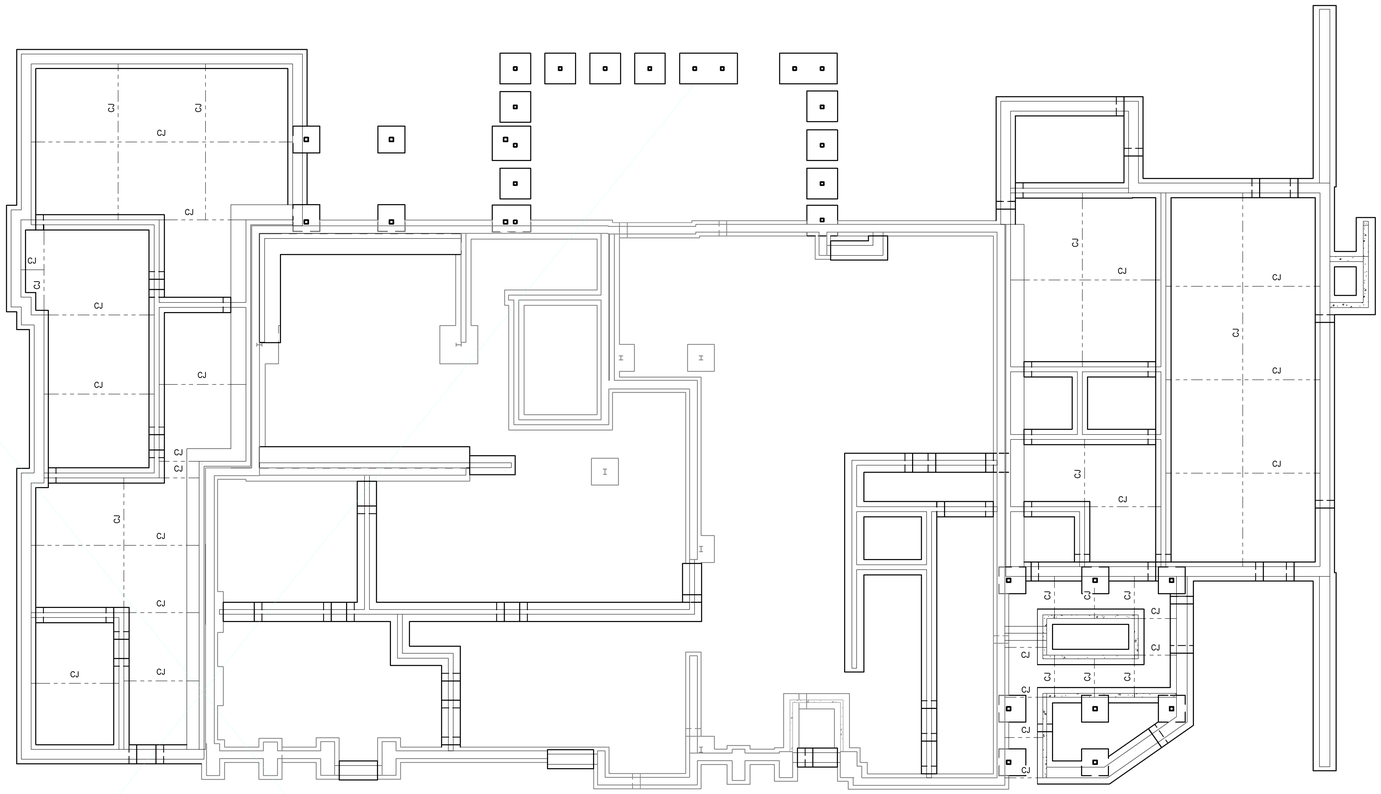
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
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REVISIONS	
DATE	DESCRIPTION

FOUNDATION PLAN

S1.0.1

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SLAB ON GRADE CONTROL JOINT LAYOUT PLAN

1/8" = 1'-0"

SLAB ON GRADE CONSTRUCTION / CONTROL JOINT NOTES:

1. REFER TO DRAWING S1.0.1 FOR FOUNDATION PLAN NOTES. REFER TO DRAWING S3.1.2 FOR TYPICAL SLAB DETAILS.
2. LOCATE CONSTRUCTION JOINTS AND/OR CONTROL JOINTS AT COLUMN CENTERLINES.
3. LOCATE CONSTRUCTION JOINTS AND/OR CONTROL JOINTS AT RE-ENTRANT CORNERS.
4. LOCATE CONSTRUCTION JOINTS PER "PLAN DETAIL AT INTERIOR DOORS".
5. PROVIDE DIAMOND OR CIRCULAR BLOCKOUTS AT COLUMNS.
6. REINFORCE ALL RE-ENTRANT CORNERS OF SLAB PER "SLAB REINFORCING AT RE-ENTRANT CORNER" DETAIL. CONTROL JOINT NOT REQUIRED IF DIMENSION AT RE-ENTRANT CORNER IS 2'-0" OR LESS.
7. PROVIDE BOND BREAK WHERE FLOOR ABUTS CMU OR CONCRETE WALL UNLESS NOTED OTHERWISE.
8. CONSTRUCTION JOINT / CONTROL JOINT PLAN AT EXISTING SLAB ON GRADE INFILL SHALL BE SUBMITTED FOR REVIEW. PROVIDE CONTROL JOINTS SUCH THAT THE AREA BOUNDED BY CONTROL JOINTS DOES NOT EXCEED 225 SQUARE FEET AND JOINT SPACING DOES NOT EXCEED 15'-0" ON CENTER IN ANY ONE DIRECTION. THE RATIO OF LENGTH TO WIDTH OF THE AREA BOUNDED BY CONTROL JOINTS SHALL NOT EXCEED 1.5 TO 1.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
Jeffrey S. O'Beirne
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

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SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

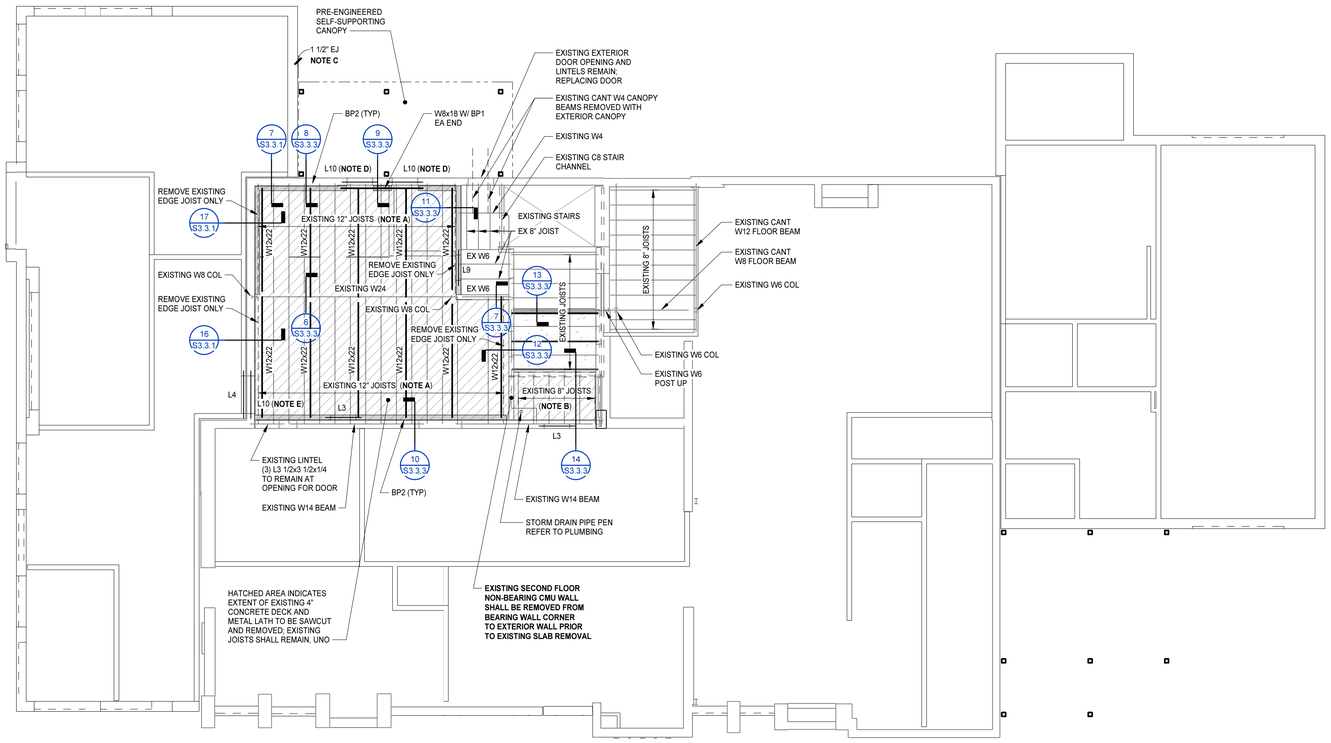
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SLAB ON GRADE CONTROL JOINT LAYOUT PLAN

S1.0.2

11/2/2026 12:10:43 PM



SECOND FLOOR FRAMING PLAN

1/8" = 1'-0"

FLOOR FRAMING PLAN NOTES:

1. TOP OF EXISTING SECOND FLOOR SLAB (±12'-0") RELATIVE TO EXISTING FINISHED FIRST FLOOR. TOP OF SECOND FLOOR SLAB SHALL MATCH EXISTING SECOND FLOOR SLAB (±12'-0"). TOP OF EXISTING SECOND FLOOR MECHANICAL ROOMS ARE (±10'-0") AND (±9'-10") RELATIVE TO EXISTING FINISHED FIRST FLOOR.
2. TOP OF SECOND FLOOR BEAMS SHALL BE (-0'-4") RELATIVE TO FINISHED SECOND FLOOR, UNO.
3. TOP OF STEEL BEAMS INDICATED THUS (+X'-X") ON PLAN SHALL BE REFERENCED FROM FINISHED FIRST FLOOR ELEVATION.
4. REFER TO "RENOVATION" NOTES ON DRAWING S0.1.1 FOR EXISTING CONSTRUCTION.
5. FLOOR CONSTRUCTION SHALL BE 2 1/2" NORMAL WEIGHT CONCRETE SLAB ON 1 1/2" COMPOSITE FLOOR DECK (DECK TYPE 3), (4" TOTAL SLAB THICKNESS). COMPOSITE FLOOR DECK SHALL BE CONNECTED TO FLOOR BEAMS ONLY. DO NOT CONNECT TO EXISTING FLOOR JOISTS, UNLESS INDICATED. REINFORCE SLAB WITH 6x6-W2.9xW2.9 WWF AT MID-DEPTH. REFER TO DRAWING S3.1.5 FOR STEEL DECK SCHEDULE.
6. REFER TO ARCH DRAWING A0.3.1 FOR DEMOLITION PLANS.
7. WALLS SHADED THUS " ▒ " ARE SHEAR WALLS. SHEAR WALLS SHALL BE GROUTED SOLID (UNO) WITH CONTROL JOINTS AS INDICATED, AND NO CLOSER THAN 30'-0" OC. NO REINFORCING IN THESE WALLS IS ALLOWED TO BE CUT. LOCATE ALL PIPING AND CONDUIT OUTSIDE OF REINFORCED CELLS. TWO VERTICAL BARS, SPACED 8" APART, SHALL BE LOCATED AT EACH END OF THE SHEAR WALL. ALL VERTICAL REINFORCEMENT IS FULL WALL HEIGHT, UNO.
8. REFER TO DRAWING S0.1.1 FOR GENERAL NOTES, PLAN LEGEND, AND STRUCTURAL ABBREVIATIONS.
9. REFER TO DRAWINGS S3.1.5 AND S3.1.6 FOR TYPICAL FRAMING DETAILS AND SCHEDULES.

NOTE A: EXISTING 12" FLOOR JOISTS SHALL REMAIN IN PLACE, UNO ON PLAN. EXISTING FLOOR JOISTS BRACE EXISTING EXTERIOR WALL.

NOTE B: EXISTING 8" FLOOR JOISTS SHALL REMAIN IN PLACE AND BE USED FOR CONCRETE SLAB ON COMPOSITE FLOOR DECK SUPPORT. COMPOSITE FLOOR DECK SHALL BE CONNECTED TO EXISTING 8" FLOOR JOISTS AND EDGE FLOOR BEAM IN THIS AREA.

NOTE C: EXPANSION JOINT SHALL CONTINUE ACROSS EDGE OF CANOPY. CANOPY SHALL NOT CONNECT ACROSS EXPANSION JOINT TO ADDITION. CANOPY MANUFACTURER SHALL PROVIDE SLIP CONNECTION FLASHING ACROSS EXPANSION JOINT.

NOTE D: REMOVE EXISTING BRICK VENEER BETWEEN AND BELOW OPENINGS. PROVIDE TOOTHED-IN CMU INFILL BETWEEN OPENINGS (DO NOT STACK). REMOVE EXISTING PRECAST VENEER HEADER, SILL AND JAMBS. REMOVE EXISTING LINTEL AND PROVIDE LINTELS AS INDICATED. PROVIDE BRICK AT HEAD, BRICK SILL, AND TOOTH-IN BRICK AT JAMBS.

NOTE E: FIELD VERIFY EXISTING LINTEL TYPE AS STEEL BEAM WITH BOTTOM PLATE AND CONTACT ENGINEER IF ANY DISCREPANCIES. EXISTING LINTEL REMAINS. PROVIDE NEEDLE BEAM SHORING ABOVE EXISTING STEEL BEAM LINTEL. CONNECT SHORING TO BEAM (HANG LOAD) OVER CASED OPENING LOCATION TO ALLOW FOR CASED OPENING LINTEL INSTALLATION. REMOVE EXISTING PRECAST VENEER HEADER, SILL AND JAMBS TO AVOID INTERFERENCE WITH EXPANSION JOINT.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
Jeffrey S. O'Beirne
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

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TOWN OF SOUTH HILL
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SECOND FLOOR FRAMING PLAN

S1.1.1

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HIGH ROOF FRAMING PLAN

1/8" = 1'-0"

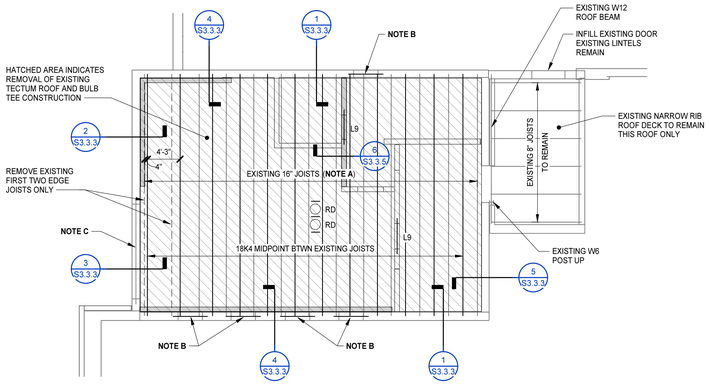
HIGH ROOF FRAMING PLAN NOTES:

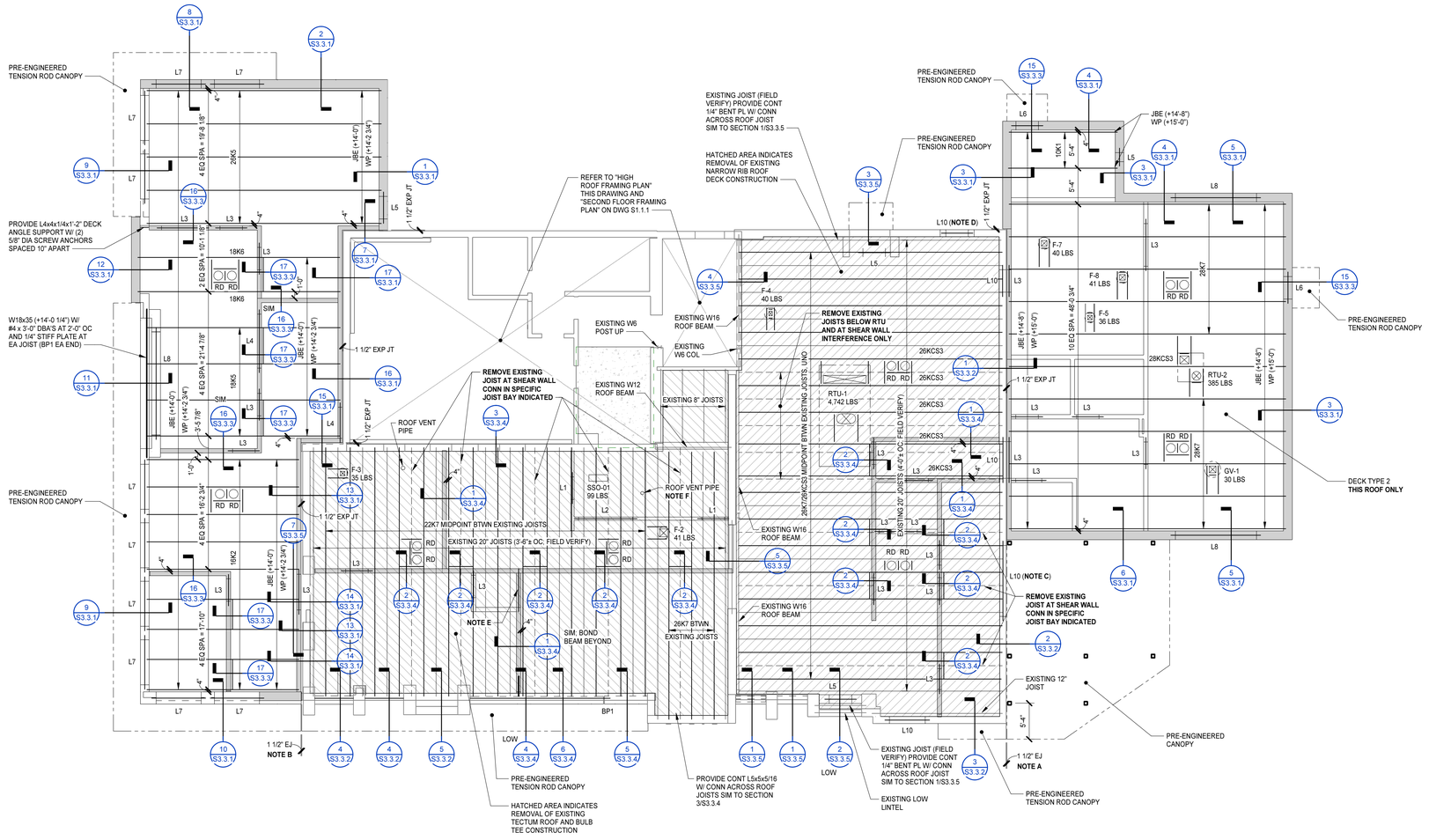
1. TOP OF STEEL BEAMS INDICATED THUS (+X'-X") ON PLAN SHALL BE REFERENCED FROM FINISHED FIRST FLOOR ELEVATION.
2. STEEL ROOF DECK SHALL BE 1 1/2" WIDE RIB ROOF DECK (DECK TYPE 1), UNO. REFER TO STEEL DECK SCHEDULE ON DRAWING S3.1.5 FOR DECK TYPES INDICATED ON PLAN. REFER TO FRAMING PLAN AND ARCHITECTURAL AND STRUCTURAL SECTIONS FOR EXTENT OF DECK TYPES. REPLACEMENT STEEL ROOF DECK (INDICATED HATCHED ON PLAN) SHALL NOT BE ATTACHED TO EXISTING ROOF JOISTS, EXCEPT FOR END OF DECK AT EXISTING EDGE JOIST CONDITIONS.
3. REFER TO "RENOVATION" NOTES ON DRAWING S0.1.1 FOR EXISTING CONSTRUCTION.
4. REFER TO ARCH DRAWING A0.3.1 FOR DEMOLITION PLANS.
5. WALLS SHADED THUS " ▒ " ARE SHEAR WALLS. SHEAR WALLS SHALL BE GROUTED SOLID (UNO) WITH CONTROL JOINTS AS INDICATED, AND NO CLOSER THAN 30'-0" OC. NO REINFORCING IN THESE WALLS IS ALLOWED TO BE CUT. LOCATE ALL PIPING AND CONDUIT OUTSIDE OF REINFORCED CELLS. TWO VERTICAL BARS, SPACED 8" APART, SHALL BE LOCATED AT EACH END OF THE SHEAR WALL. ALL VERTICAL REINFORCEMENT IS FULL WALL HEIGHT, UNO.
6. REFER TO DRAWING S0.1.1 FOR GENERAL NOTES, PLAN LEGEND, AND STRUCTURAL ABBREVIATIONS.
7. REFER TO DRAWINGS S3.1.5 AND S3.1.6 FOR TYPICAL FRAMING DETAILS AND SCHEDULES.

NOTE A: EXISTING 16" ROOF JOISTS SHALL REMAIN IN PLACE, UNO ON PLAN. EXISTING ROOF JOISTS BRACE EXISTING EXTERIOR WALL.

NOTE B: EXISTING CMU WALL OPENING AND LINTEL REMAIN. REMOVE EXISTING PRECAST VENEER HEADER, SILL AND JAMBS. REMOVE EXISTING LOOSE BRICK ANGLE. PROVIDE BRICK AT HEAD, BRICK SILL, AND TOOTH-IN BRICK AT JAMBS. PROVIDE LOOSE L3-1/2x3-1/2x1/4 BRICK ANGLE FOR BRICK AT HEAD AND BEAR ON TOOTHED-IN BRICK JAMBS.

NOTE C: FIELD VERIFY EXISTING LINTEL TYPE AS STEEL BEAM WITH BOTTOM PLATE AND CONTACT ENGINEER IF ANY DISCREPANCIES. EXISTING CMU WALL OPENING AND LINTEL REMAIN. REMOVE EXISTING PRECAST VENEER HEADER, SILL AND JAMBS. PROVIDE BRICK AT HEAD, BRICK SILL, AND TOOTH-IN BRICK AT JAMBS.





LOW ROOF FRAMING PLAN

1/8" = 1'-0"

LOW ROOF FRAMING PLAN NOTES:

1. TOP OF STEEL BEAMS INDICATED THUS (+X'-X") ON PLAN SHALL BE REFERENCED FROM FINISHED FIRST FLOOR ELEVATION.
2. STEEL ROOF DECK SHALL BE 1 1/2" WIDE RIB ROOF DECK (DECK TYPE 1), UNO. REFER TO STEEL DECK SCHEDULE ON DRAWING S3.1.5 FOR DECK TYPES INDICATED ON PLAN. REFER TO FRAMING PLAN AND ARCHITECTURAL AND STRUCTURAL SECTIONS FOR EXTENT OF DECK TYPES. REPLACEMENT STEEL ROOF DECK (INDICATED HATCHED ON PLAN) SHALL NOT BE ATTACHED TO EXISTING ROOF JOISTS, EXCEPT FOR END OF DECK AT EXISTING EDGE JOIST CONDITIONS.
3. REFER TO "RENOVATION" NOTES ON DRAWING S0.1.1 FOR EXISTING CONSTRUCTION.
4. REFER TO ARCH DRAWING A0.3.1 FOR DEMOLITION PLANS.
5. WALLS SHADED THUS " ▒ " ARE SHEAR WALLS. SHEAR WALLS SHALL BE GROUTED SOLID (UNO) WITH CONTROL JOINTS AS INDICATED, AND NO CLOSER THAN 30'-0" OC. NO REINFORCING IN THESE WALLS IS ALLOWED TO BE CUT. LOCATE ALL PIPING AND CONDUIT OUTSIDE OF REINFORCED CELLS. TWO VERTICAL BARS, SPACED 8" APART, SHALL BE LOCATED AT EACH END OF THE SHEAR WALL. ALL VERTICAL REINFORCEMENT IS FULL WALL HEIGHT, UNO.
6. REFER TO DRAWING S0.1.1 FOR GENERAL NOTES, PLAN LEGEND, AND STRUCTURAL ABBREVIATIONS.
7. REFER TO DRAWINGS S3.1.5 AND S3.1.6 FOR TYPICAL FRAMING DETAILS AND SCHEDULES.

NOTE A: EXPANSION JOINT SHALL CONTINUE TO EDGE OF CANOPIES. TENSION ROD CANOPY AND FREE STANDING CANOPY SHALL NOT CONNECT ACROSS EXPANSION JOINT. CANOPY MANUFACTURER SHALL PROVIDE SLIP CONNECTION AT FASCIA BETWEEN CANOPIES.

NOTE B: EXPANSION JOINT SHALL CONTINUE TO EDGE OF CANOPIES. TENSION ROD CANOPIES SHALL NOT CONNECT ACROSS EXPANSION JOINT. CANOPY MANUFACTURER SHALL PROVIDE SLIP CONNECTION AT FASCIA BETWEEN CANOPIES.

NOTE C: THE FIRST JAMB CELL AT EACH END OF MASONRY OPENING SHALL BE GROUTED SOLID BELOW LINTEL BEARING.

NOTE D: CMU JAMB INFILL SHALL BE TOOTHED-IN AND NOT STACKED BELOW LINTEL BEARING.

NOTE E: PROVIDE CONT 8x24 BOND BEAM (REINF W/ (2) #5 CONT EA COURSE) W/ CUT GROUTED SOLID TOP COURSE ACROSS CORRIDOR, TO ALLOW CONTINUATION OF SHEAR WALL CONNECTION. PROVIDE 1" GAP BELOW ROOF DECK TO CUT TOP COURSE. REFER TO SECTION 1/S3.3.4 FOR CONNECTIONS.

NOTE F: PROVIDE AND COORDINATE UNISTRUT HANGERS FROM ROOF JOISTS WITH MANUFACTURER FOR SUPPORTING CEILING MOUNTED TASK EXHAUSTER/FAN AT SUSPENDED CEILING.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
Jeffrey S. O'Beirne
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

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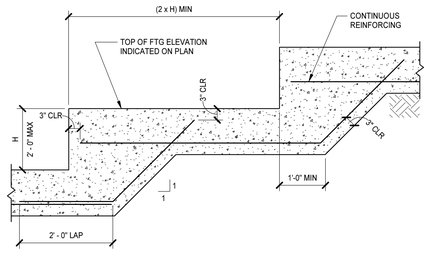
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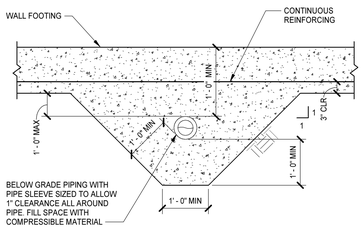
ROOF FRAMING PLANS

S1.1.2

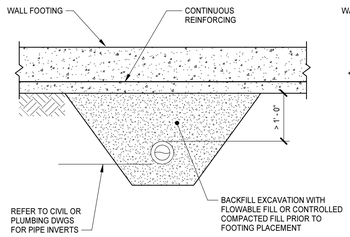
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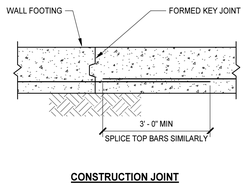
FOOTING STEP



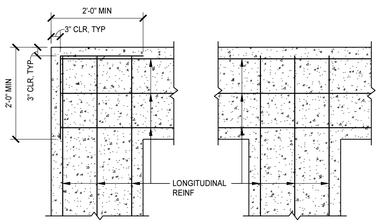
FOOTING SLEEVE



PIPE TRENCH BACKFILL AT FOOTING
(PIPE PLACED PRIOR TO FOOTING)



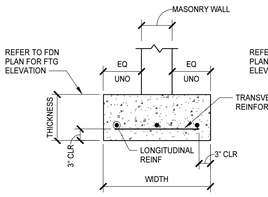
CONSTRUCTION JOINT



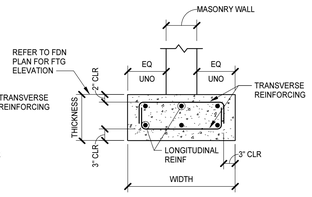
PLAN AT CORNER

PLAN AT INTERSECTION

WALL FOOTING DETAILS
NO SCALE



WITH BOT REINFORCING

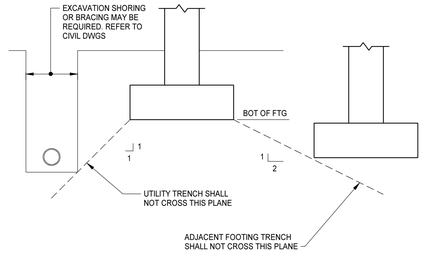


WITH TOP & BOT REINFORCING

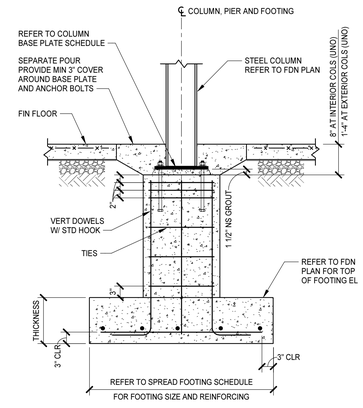
WALL FOOTING SCHEDULE

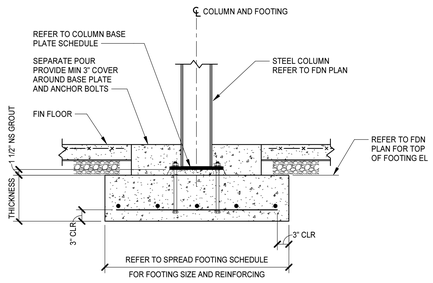
MARK	WIDTH	THICKNESS	REINFORCING (BOT, UNO)	
			LONGITUDINAL	TRANSVERSE
WF2.0	2'-0"	1'-0"	(3) #5 CONT	#5 @ 48" OC BOT
WF2.5	2'-6"	1'-0"	(3) #5 CONT	#5 @ 48" OC BOT
WF3.0	3'-0"	1'-0"	(4) #5 CONT	#5 @ 24" OC BOT

WALL FOOTING DETAILS
NO SCALE



FOOTING EXCAVATION LIMITS
NO SCALE

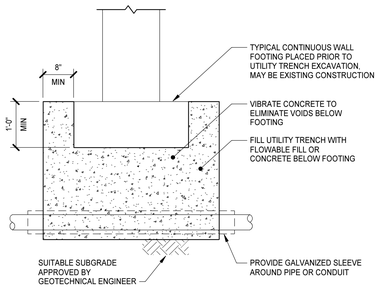




SPREAD FOOTING SCHEDULE

MARK	SIZE			REINFORCING	REMARKS
	LENGTH	WIDTH	THICKNESS		
3.5	3'-6"	3'-6"	1'-6"	(4) #5 EA WAY BOT; (4) #5 EA WAY TOP	REFER TO FDN SECTION AT PRE-ENGINEERED CANOPY COLUMNS
4.0	4'-0"	4'-0"	1'-3"	(5) #5 EA WAY TOP & BOT	
4.6	4'-6"	5'-0"	1'-6"	(5) #5 EA WAY TOP & BOT	COORD TOP REINF TO AVOID PRE-ENGINEERED CANOPY COLUMN EMBED
7.6	4'-0"	7'-6"	1'-3"	(8) #5 TOP & BOT (SHORT); (5) #5 TOP & BOT (LONG)	

STEEL COLUMN FOOTING DETAILS
NO SCALE



UNDERMINED FOOTING DETAIL
NO SCALE

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
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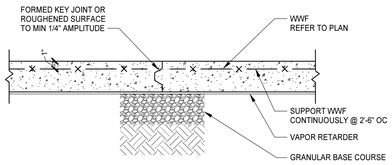
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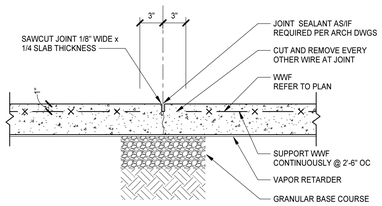
TYPICAL FOUNDATION DETAILS

S3.1.1

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CONSTRUCTION JOINT



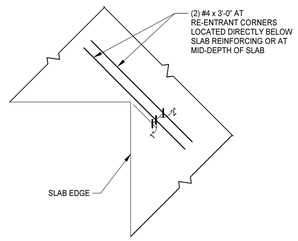
CONTROL JOINT

NOTES:

1. SAWCUT AS SOON AS CONCRETE WILL SUPPORT EQUIPMENT AND EARLY ENOUGH TO PREVENT CRACKING. DO NOT DISLODGE AGGREGATE.
2. CONSTRUCTION JOINT MAY REPLACE CONTROL JOINT.

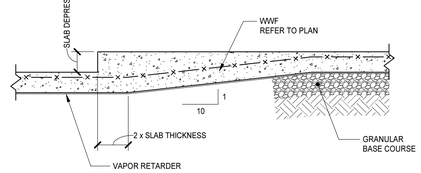
SLAB-ON-GRADE JOINT DETAILS

NO SCALE



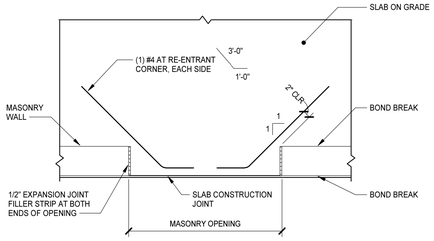
SLAB REINFORCING AT RE-ENTRANT CORNER

NO SCALE

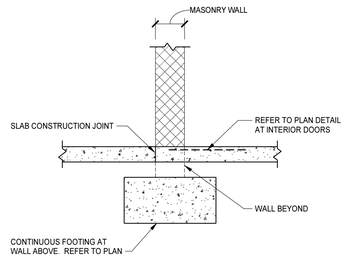


DETAIL AT SLAB DEPRESSION

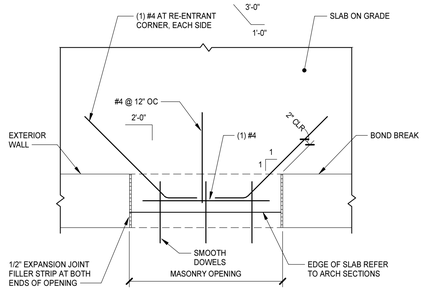
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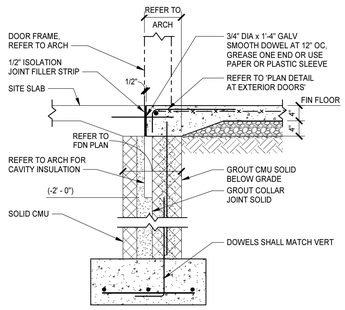
PLAN AT INTERIOR DOORS



SECTION AT INTERIOR DOORS



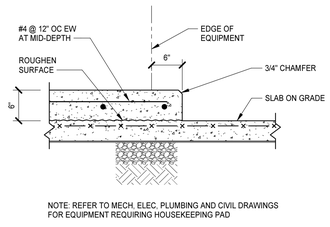
PLAN AT EXTERIOR DOORS



SECTION AT EXTERIOR DOORS

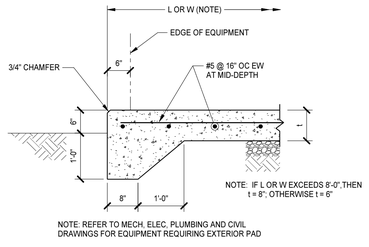
SLAB ON GRADE DETAILS AT DOORS

NO SCALE



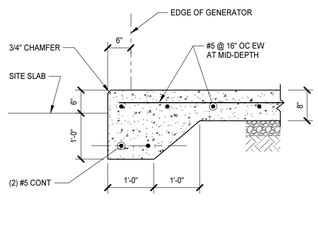
NOTE: REFER TO MECH, ELEC, PLUMBING AND CIVIL DRAWINGS FOR EQUIPMENT REQUIRING HOUSEKEEPING PAD

HOUSEKEEPING PAD



NOTE: REFER TO MECH, ELEC, PLUMBING AND CIVIL DRAWINGS FOR EQUIPMENT REQUIRING EXTERIOR PAD

EXTERIOR TRANSFORMER AND EQUIPMENT PAD



GENERATOR PAD

EQUIPMENT PAD DETAILS

NO SCALE

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

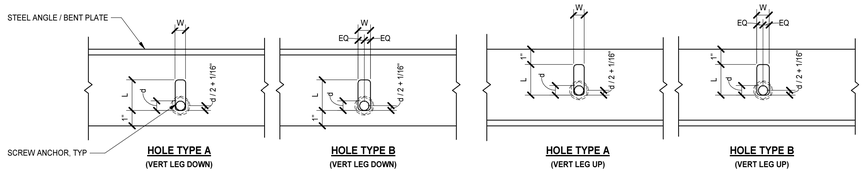
REVISIONS	
DATE	DESCRIPTION

TYPICAL SLAB DETAILS

S3.1.2

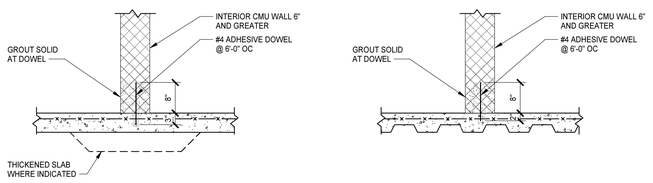
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SCREW ANCHOR HOLE SCHEDULE						
	STANDARD	OVERSIZED	HOLE TYPE A		HOLE TYPE B	
ANCHOR DIA	DIAMETER (in)	DIAMETER (in)	W (in)	L (in)	W (in)	L (in)
3/8"	**7/16**	**9/16**	**7/16**	**2**	**9/16**	**2**
1/2"	**9/16**	**11/16**	**9/16**	**2**	**11/16**	**2**
5/8"	**11/16**	**13/16**	**11/16**	**2**	**13/16**	**2**
3/4"	**13/16**	**15/16**	**13/16**	**2 1/4**	**15/16**	**2 1/4**
NOTES	**STANDARD HOLES, UNO**	**BACK SCREW ANCHORS OFF 1/2 TURN AFTER TIGHTENING**				



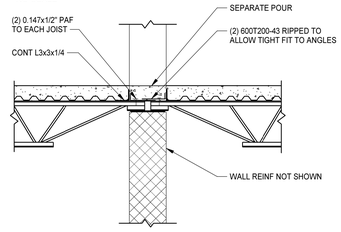
SCREW ANCHOR HOLE INSTALLATION DETAILS

NO SCALE



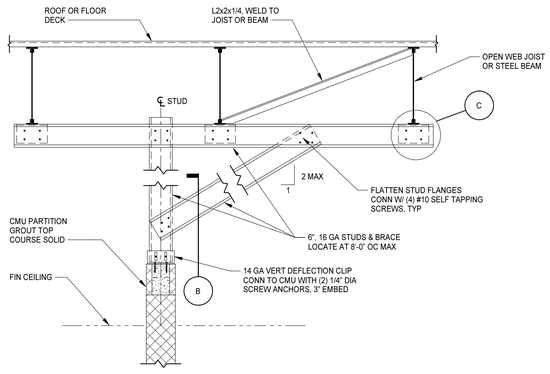
BASE ANCHORAGE OF UNREINFORCED CMU WALLS

NO SCALE

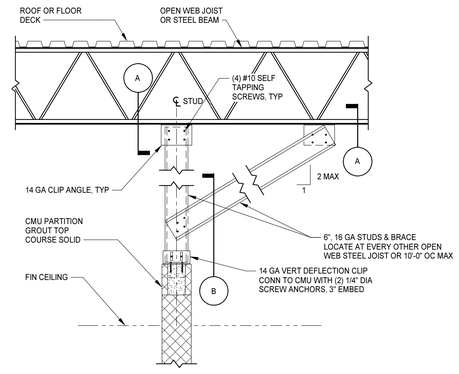


INFILL SLAB AT CORRIDOR OPENINGS

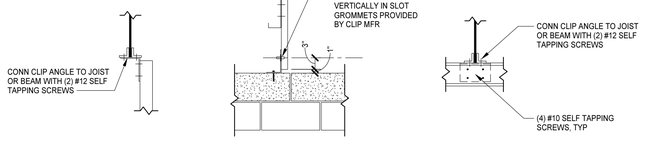
NO SCALE



LOW WALL PARALLEL TO JOIST OR BEAM



LOW WALL PERPENDICULAR TO JOIST OR BEAM



BRACING DETAILS FOR NON-LOAD BEARING INTERIOR MASONRY PARTITIONS

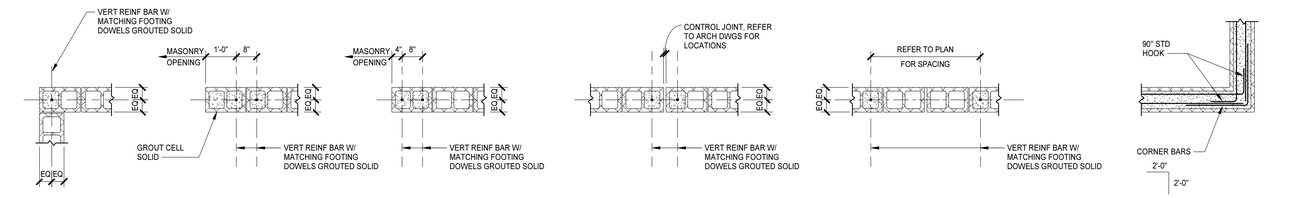
NO SCALE

NOTES:

1. BRACE INTERIOR NON-LOAD BEARING MASONRY WALLS IN ACCORDANCE WITH THESE DETAILS UNLESS OTHERWISE INDICATED.
2. IN LIEU OF BRACING AT TOPS OF WALLS, BRACING MAY BE PROVIDED BY INTERSECTING MASONRY WALLS WHEN THE DISTANCE BETWEEN THE INTERSECTING WALLS DOES NOT EXCEED THE FOLLOWING:

NOMINAL THICKNESS OF BRACED WALLS	MAXIMUM SPACING BETWEEN INTERSECTING WALLS
4"	12'-0"
6"	16'-0"
8"	22'-0"
10"	26'-0"
12"	30'-0"

3. BRACING IS REQUIRED IN ACCORDANCE WITH THESE DETAILS IF A VERTICAL CONTROL JOINT OCCURS BETWEEN INTERSECTING WALLS.
4. REFER TO ARCHITECTURAL DRAWINGS FOR INTERIOR PARTITION TYPES AND LOCATIONS.
5. INSTALL BRACING AFTER ALL ROOF DEAD LOAD IS IN PLACE.

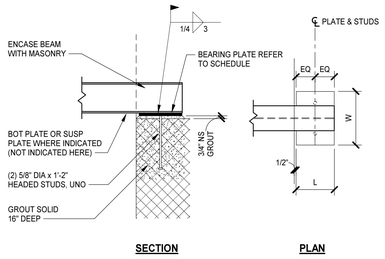


NOTES:

1. REINFORCING BAR SIZE INDICATED ON FOUNDATION PLAN.
2. DETAILS ARE PROVIDED FOR VERTICAL REINFORCING STEEL PLACEMENT ONLY. REFER TO ARCHITECTS DRAWINGS FOR SPECIFIC MASONRY DETAILS.
3. DO NOT PLACE CONDUIT IN CELLS CONTAINING STRUCTURAL REINFORCING.

CMU WALL REINFORCING DETAILS

NO SCALE



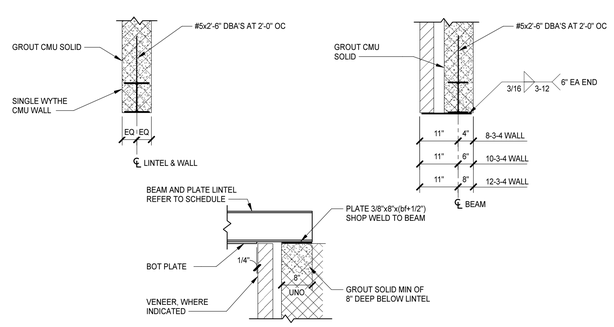
BEAM ANCHORAGE DETAILS

NO SCALE

BEARING PLATE SCHEDULE				
MARK	SIZE			REMARKS
	W	t	L	
BP1	7"	3/8"	9"	(2) 1/2" DIA x 6" HEADED STUDS
BP2	9"	1/2"	7"	
REFER TO BEAM ANCHORAGE DETAILS				

LINTEL SCHEDULE

MARK	DIAGRAM	BOND BEAM (W x H)	REINFORCING	STEEL	NOTES
L1		6 x 8	(1) #5 CONT	———	———
L2		6 x 16	(1) #5 CONT, EA COURSE	———	———
L3		8 x 8	(2) #5 CONT	———	———
L4		8 x 16	(2) #5 CONT, EA COURSE	———	———
L5		8 x 8	(2) #5 CONT	CONT L6x3-1/2x5/16" (LLV) W/ 1/2" DIA SCREW ANCHORS 4" FROM EA END AND AT 16" OC, SET 1-1/2" FROM TOP OF VERT LEG	LOOSE BRICK L3-1/2x3-1/2x5/16
L6		8 x 24	(2) #5 CONT, EA COURSE	CONT L6x3-1/2x5/16" (LLV) W/ 1/2" DIA SCREW ANCHORS 4" FROM EA END AND AT 16" OC, SET 1-1/2" FROM TOP OF VERT LEG	LOOSE BRICK L3-1/2x3-1/2x5/16
L7		8 x 16	(2) #5 CONT, EA COURSE	CONT L6x3-1/2x5/16" (LLV) W/ 1/2" DIA SCREW ANCHORS 4" FROM EA END AND AT 16" OC, SET 1-1/2" FROM TOP OF VERT LEG	LOOSE BRICK L5x3-1/2x3/8 (LLV)
L8		8 x 24	(2) #5 CONT, EA COURSE	CONT 12x7x3/8" BENT PLATE (LLV) W/ 5/8" DIA SCREW ANCHORS 4" FROM EA END AND AT 16" OC, SET 1-1/2" FROM TOP OF VERT LEG	———
L9		———	———	W8x18 W/ 1/4" x 0'-7" BOTTOM PLATE (CENTERED)	FIELD VERIFY EXISTING WALL WIDTH TO DETERMINE BOT PLATE WIDTH
L10		———	———	W8x18 W/ 5/16" x 0'-11-1/2" BOTTOM PLATE (PLATE 1/2" OFF BRICK FACE)	FIELD VERIFY EXISTING WALL WIDTH TO DETERMINE BOT PLATE WIDTH



STEEL LINTEL DETAILS (CMU BACKUP)

LINTEL NOTES

1. LINTELS FOR ARCHITECTURAL OPENINGS (WINDOWS, DOORS, LOUVERS) IN BEARING WALLS AND EXTERIOR WALLS ARE IDENTIFIED BY MARK NUMBER ON THE FRAMING PLAN(S) AND INCLUDED IN THE LINTEL SCHEDULE.
2. LINTELS FOR ARCHITECTURAL OPENINGS IN NON-LOAD BEARING WALLS AND OTHER WALLS WHICH ARE NOT INDICATED ON THE FRAMING PLAN(S) SHALL BE CONSTRUCTED PER NOTES A, B OR C BELOW.

   A. STEEL ANGLE LINTELS

   PROVIDE ONE ANGLE FOR EACH NOMINAL 4" OF WALL THICKNESS PER THE FOLLOWING SCHEDULE.

MASONRY OPENING	ANGLE SIZE
UP TO 5'-0"	L3 1/2x3 1/2x 5/16
5'-1" TO 6'-0"	L4x3 1/2x 5/16 (LLV)
6'-1" TO 7'-0"	L5x3 1/2x 3/8 (LLV)
OVER 7'-0"	AS DETAILED

   FOR OPENINGS IN 10" CMU, HORIZONTAL LEGS OF ANGLES SHALL BE A COMBINATION OF 5" AND 4".

   FOR OPENINGS IN 6" CMU REQUIRING STEEL LINTELS, USE WT7x11 UP TO 7'-0" OPENING.

   B. REINFORCED BOND BEAM LINTELS

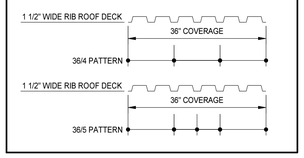
   LINTELS SHALL MATCH THICKNESS OF WALL. REINFORCE 8", 10" AND 12" BOND BEAM WITH (2) #5 BARS AT BOTTOM. REINFORCE 6" BOND BEAM WITH (1) #5 BAR AT BOTTOM. BOND BEAM SHALL BE 8" DEEP FOR OPENING WIDTH UP TO 5'-0", AND SHALL BEAR 8" ON SOLID MASONRY EACH END. BOND BEAM SHALL BE 16" DEEP FOR OPENING WIDTH UP TO 6'-0" AND SHALL BEAR 16" ON SOLID MASONRY EACH END WITH REINFORCING TOP AND BOTTOM. PLACE GROUT MONOLITHICALLY IN BOTH COURSES OF 16" DEEP BOND BEAM.

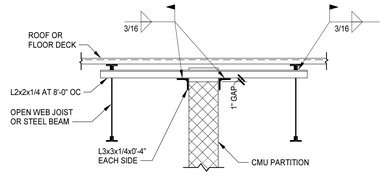
   C. PRECAST CONCRETE LINTELS

   PRECAST CONCRETE LINTELS SHALL BE 3 5/8" x 7 5/8" FOR EACH NOMINAL 4" THICKNESS OF WALL. REINFORCING SHALL BE (1) #4 TOP AND BOTTOM WITH 1 1/2" COVER. FOR OPENINGS IN 6" CMU, LINTEL SHALL BE 5 5/8" x 7 5/8". REINFORCED WITH (1) #5 TOP AND BOTTOM. MASONRY OPENING WIDTH SHALL BE 6'-0" OR LESS. DO NOT USE PRECAST CONCRETE LINTELS IN EXPOSED LOCATIONS.
3. LINTELS FOR MECHANICAL DUCTWORK PENETRATIONS NOT OTHERWISE DETAILED SHALL BE ONE OF THE ABOVE (NOTE 2A, 2B OR 2C).
4. LINTELS SHALL BEAR 8" ONTO SOLID OR GROUT FILLED MASONRY, UNLESS OTHERWISE INDICATED.
5. LINTELS ARE REQUIRED OVER ALL MASONRY OPENINGS GREATER THAN 8" IN WIDTH.
6. LINTELS ARE NOT REQUIRED ABOVE HOLLOW METAL FRAMES IN OPENINGS 3'-4" OR LESS IN 6" NON-BEARING MASONRY PARTITIONS. GROUT HEAD OF FRAMES SOLID BEFORE PLACING MASONRY.
7. ALL LINTELS IN EXTERIOR WALLS SHALL BE GALVANIZED.
8. AT LINTELS IN EXISTING CONSTRUCTION, REFER TO "TEMPORARY SHORING" NOTES ON DRAWING S0.1.1.

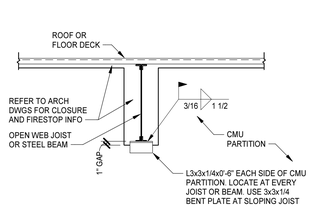
STEEL DECK SCHEDULE		
DECK TYPE 1	1 1/2" - 18 GAGE WIDE RIB ROOF DECK, GALVANIZED	FASTEN TO ALL SUPPORTS WITH 5/8" DIAMETER PUDDLE WELDS AT 36/4 PATTERN, AND AT 6" OC AT ALL EDGES AND END LAPS. FASTEN SIDELAPS WITH MINIMUM (2) #10 TEK SCREWS EQ SPACED OVER SPAN AND NOT GREATER THAN 24" OC.
DECK TYPE 2	1 1/2" - 20 GAGE WIDE RIB ROOF DECK, GALVANIZED	FASTEN TO ALL SUPPORTS WITH 5/8" DIAMETER PUDDLE WELDS AT 36/4 PATTERN, AND AT 6" OC AT ALL EDGES AND END LAPS. FASTEN SIDELAPS WITH MINIMUM (2) #10 TEK SCREWS EQ SPACED OVER SPAN AND NOT GREATER THAN 24" OC.
DECK TYPE 3	1 1/2" - 18 GAGE COMPOSITE FLOOR DECK, GALVANIZED	FASTEN TO ALL SUPPORTS AND EDGES WITH 5/8" DIAMETER PUDDLE WELDS AT 12" OC. FASTEN SIDELAPS WITH #10 TEK SCREWS AT 24" OC.

STEEL DECK FASTENER LAYOUT

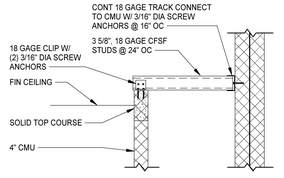




WALL TO UNDERSIDE OF DECK PARALLEL TO JOISTS



WALL TO UNDERSIDE OF DECK PERPENDICULAR TO JOISTS



4" CMU TOP OF WALL BRACING

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

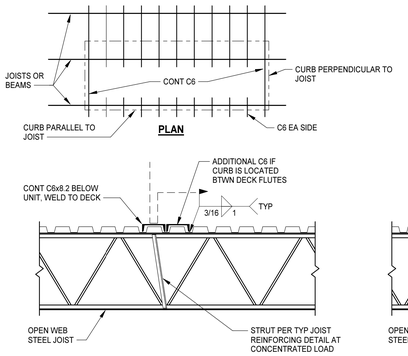
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

TYPICAL MASONRY WALL AND LINTEL DETAILS

S3.1.5

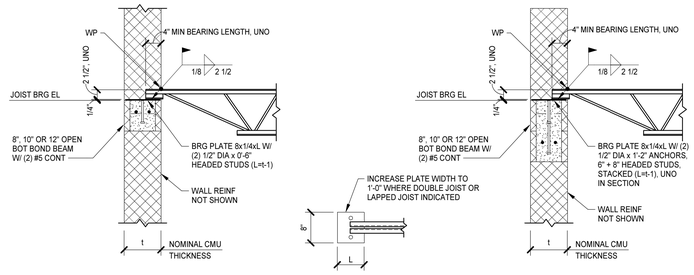
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CURB PERPENDICULAR TO JOIST **CURB PARALLEL TO JOIST**

RTU CURB SUPPORT DETAILS

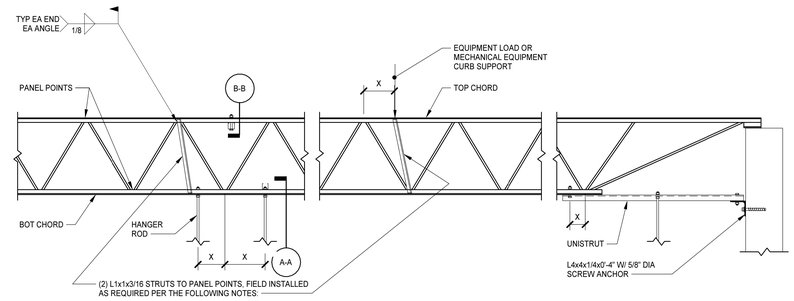
NO SCALE



SECTION AT FLOOR **PLAN DETAIL** **SECTION AT ROOF**

TYPICAL K SERIES STEEL JOIST ANCHORAGE DETAILS AT CMU WALLS

NO SCALE



K-SERIES JOISTS:

1. WHERE UTILITIES RUN PARALLEL TO JOISTS, INDIVIDUAL HANGERS SHALL BE SPACED SUCH THAT HANGER LOAD (IF DIRECTLY BELOW JOIST), OR UNISTRUT REACTION (IF PIPE IS BETWEEN JOISTS) DOES NOT EXCEED 200 LBS.
2. WHERE UTILITIES RUN PERPENDICULAR TO JOISTS, INDIVIDUAL HANGERS SHALL BE SPACED SUCH THAT HANGER LOAD DOES NOT EXCEED 200 LBS.
3. IF INDIVIDUAL HANGER LOAD EXCEEDS 200 LBS ON ANY JOIST, AND DIMENSION 'X' EXCEEDS 6", STRUTS SHALL BE INSTALLED AS INDICATED ABOVE.
4. WHERE MULTIPLE HANGERS ARE LOCATED BETWEEN PANEL POINTS, THE CUMULATIVE LOAD SHALL NOT EXCEED 200 LBS.

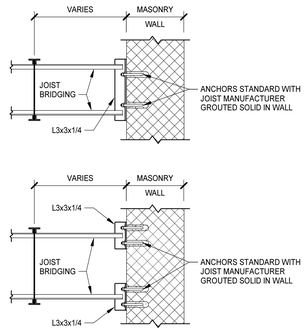
KCS AND LH-SERIES JOISTS:

1. WHERE UTILITIES RUN PARALLEL TO JOISTS, INDIVIDUAL HANGERS SHALL BE SPACED SUCH THAT HANGER LOAD (IF DIRECTLY BELOW JOIST), OR UNISTRUT REACTION (IF PIPE IS BETWEEN JOISTS) DOES NOT EXCEED 500 LBS.
2. WHERE UTILITIES RUN PERPENDICULAR TO JOISTS, INDIVIDUAL HANGERS SHALL BE SPACED SUCH THAT HANGER LOAD DOES NOT EXCEED 500 LBS, OR HANGER SHALL BE LOCATED AT EA JOIST.
3. IF INDIVIDUAL HANGER LOAD EXCEEDS 500 LBS ON ANY JOIST, AND DIMENSION 'X' EXCEEDS 6", STRUTS SHALL BE INSTALLED AS INDICATED ABOVE.
4. WHERE MULTIPLE HANGERS ARE LOCATED BETWEEN PANEL POINTS, THE CUMULATIVE LOAD SHALL NOT EXCEED 500 LBS.

GENERAL:

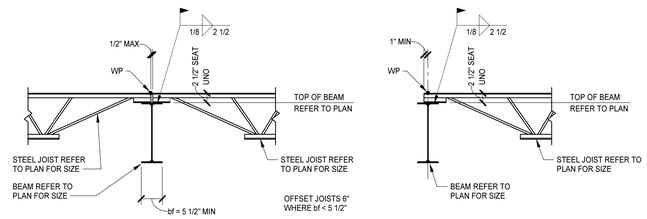
1. C-CLAMPS SHALL NOT BE USED WHERE HANGER LOAD EXCEEDS 50 LBS.
2. REFER TO DRAWING S0.0.1 FOR STEEL JOIST NOTES.

NOTE:
THE CONTRACTOR SHALL COORDINATE THESE REQUIREMENTS FOR HANGER SPACING AND JOIST REINFORCING STRUTS WITH MECHANICAL, PLUMBING, AND FIRE PROTECTION TRADES IN ORDER TO ENSURE THAT THESE REQUIREMENTS ARE ACCOUNTED FOR IN THE BID PRICE AND IMPLEMENTED IN THE FIELD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER INSTALLATION OF THE REINFORCING STRUTS IN ALL CASES WHERE THE HANGER LOAD EXCEEDS THE MAXIMUM. IF HANGER LOCATIONS ARE COORDINATED TO COMPLY WITH THE MAXIMUM HANGER LOADS INDICATED IN THIS DETAIL, THE NUMBER OF JOIST REINFORCING STRUTS WILL BE MINIMIZED.



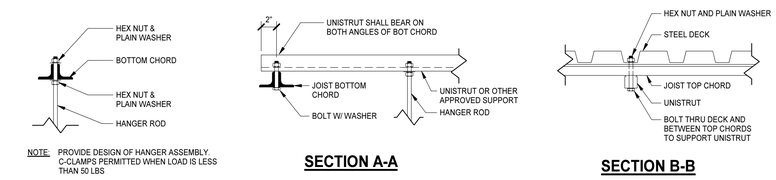
K SERIES STEEL JOIST BRIDGING ANCHORAGE

NO SCALE



CONNECTION OF K SERIES STEEL JOIST TO STEEL BEAM

NO SCALE

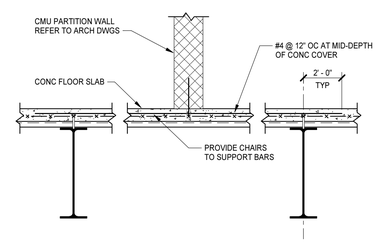


NOTE: PROVIDE DESIGN OF HANGER ASSEMBLY. C-CLAMPS PERMITTED WHEN LOAD IS LESS THAN 50 LBS

SECTION A-A **SECTION B-B**

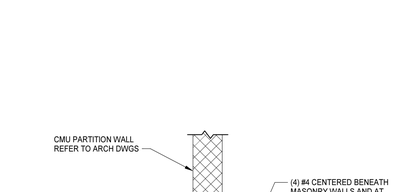
TYPICAL LOAD SUPPORTED FROM JOIST DETAIL

NO SCALE



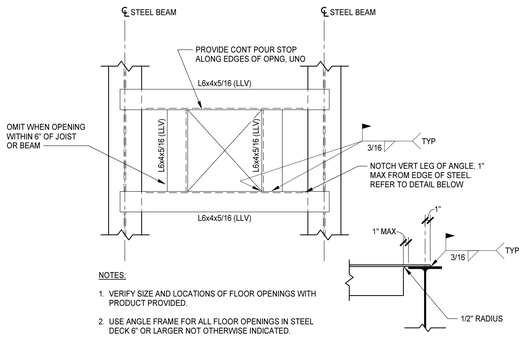
ADDITIONAL SLAB REINFORCING AT FULL HEIGHT MASONRY WALLS PARALLEL TO BEAMS

NO SCALE



ADDITIONAL SLAB REINFORCING AT FULL HEIGHT MASONRY WALLS PERPENDICULAR TO BEAMS

NO SCALE

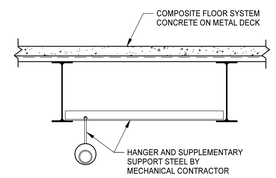


NOTES:

1. VERIFY SIZE AND LOCATIONS OF FLOOR OPENINGS WITH PRODUCT PROVIDED.
2. USE ANGLE FRAME FOR ALL FLOOR OPENINGS IN STEEL DECK 6" OR LARGER NOT OTHERWISE INDICATED.

FLOOR OPENING SUPPORT DETAIL

NO SCALE

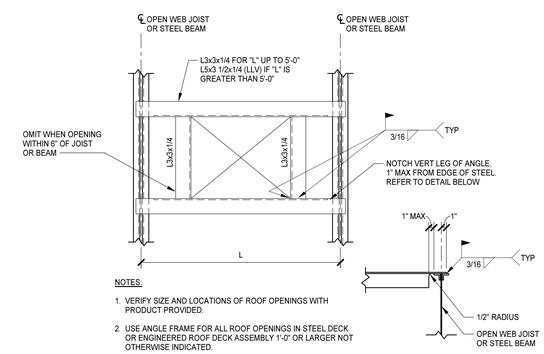


NOTES:

1. USE SUPPLEMENTAL SUPPORT STEEL FOR 5" DIA PIPE AND LARGER EXCEPT FOR 6" DIA ROOF LEADER.
2. IF SUPPLEMENTARY STEEL IS NOT IN PLACE BEFORE SPRAY FIREPROOFING, REPAIR OF DAMAGED FIREPROOFING IS THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR.

BEAM SUPPORTED UTILITY HANGER

NO SCALE

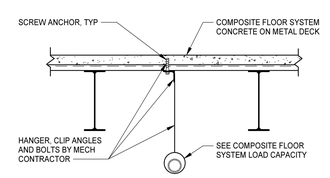


NOTES:

1. VERIFY SIZE AND LOCATIONS OF ROOF OPENINGS WITH PRODUCT PROVIDED.
2. USE ANGLE FRAME FOR ALL ROOF OPENINGS IN STEEL DECK OR ENGINEERED ROOF DECK ASSEMBLY 1'-0" OR LARGER NOT OTHERWISE INDICATED.

ROOF OPENING SUPPORT DETAIL

NO SCALE

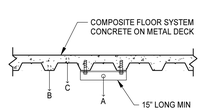


NOTE:

1. ONLY ONE CONNECTION PER RIB IN ONE SPAN OF DECK BETWEEN BEAMS/SUPPORT.

DECK SUPPORTED UTILITY HANGER

NO SCALE



COMPOSITE FLOOR SYSTEM LOAD CAPACITY	
	LOAD TO FLOOR SYSTEM
A	250 lb*
B	100 lb*
C	0 DO NOT HANG FROM THIN PORTION

* ANCHORAGE INTO CONCRETE, BY OTHERS. FOR MISC COMPONENTS AND HANGERS, SHALL BE DESIGNED FOR THE ACTUAL LOAD AND FURNISHED BY THE MECHANICAL SUB-CONTRACTOR. MECHANICAL SUB-CONTRACTOR SHALL VERIFY SCREW ANCHOR DIAMETER AND EMBEDMENT DEPTH FOR THE REQUIRED LOADING AND AVAILABLE DEPTH OF CONCRETE.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

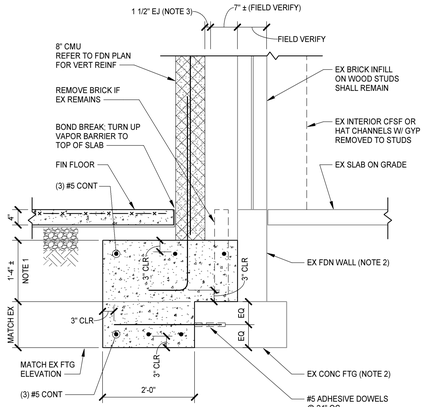
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

TYPICAL FRAMING DETAILS

S3.1.6

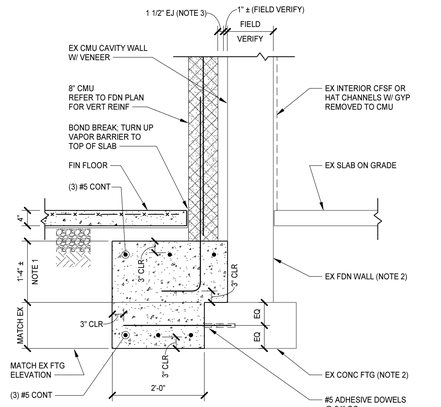
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NOTES:

1. POUR CONCRETE THICKNESS ABOVE EXISTING FTG TO ALLOW CMU COURSING. HOWEVER, CONCRETE THICKNESS SHALL BE 1'-0" MIN.
2. BELOW GRADE EXISTING FDN INFORMATION WAS UNAVAILABLE. FIELD VERIFY EXISTING CONDITIONS. REFER TO "RENOVATION" NOTE ON DRAWING S0.1.1.
3. EXPANSION JOINT SHALL BE ESTABLISHED FROM THE FACE OF FURTHEST EXISTING EXTERIOR PRECAST PANEL AFTER EIFS REMOVAL (PLAN WEST) AND MAINTAINED AT THIS LOCATION THE ENTIRE LENGTH OF THE WALL (PLAN NORTH / SOUTH).

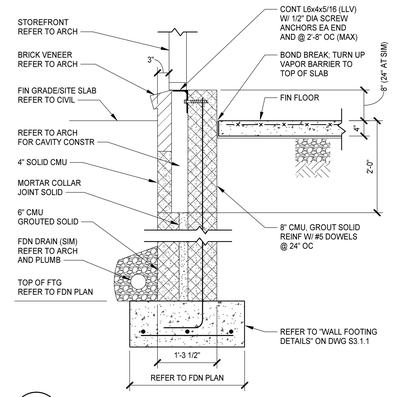
18 SECTION S1.0.1 S3.2.1 — 3/4" = 1'-0"



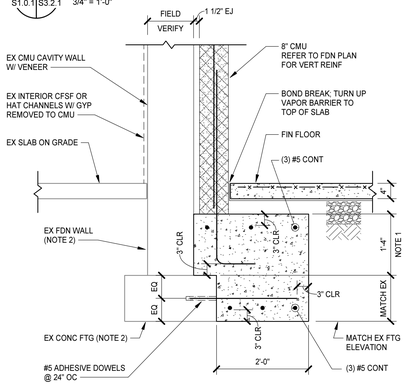
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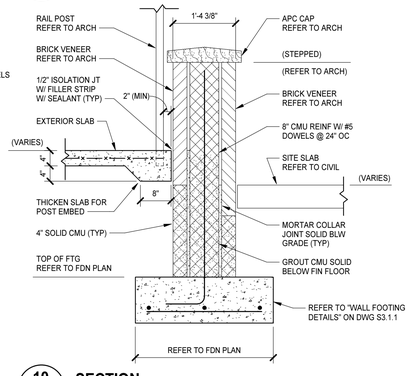
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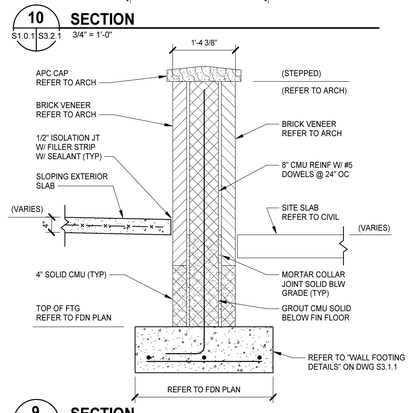
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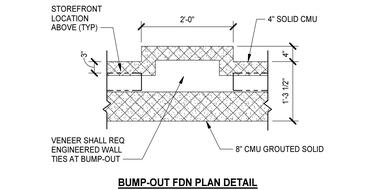
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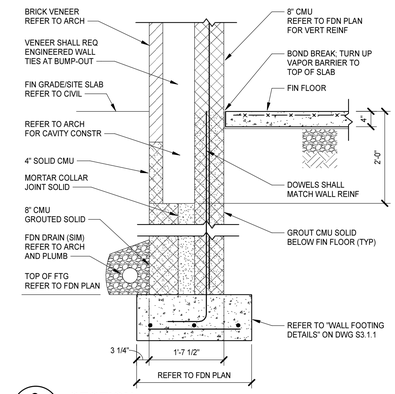
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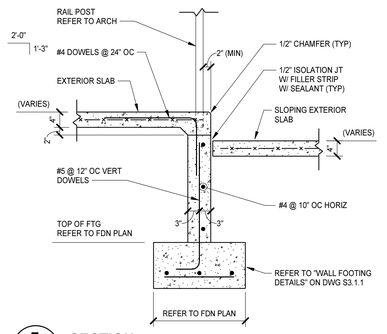
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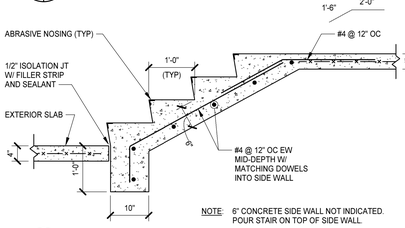
BUMP-OUT FDN PLAN DETAIL



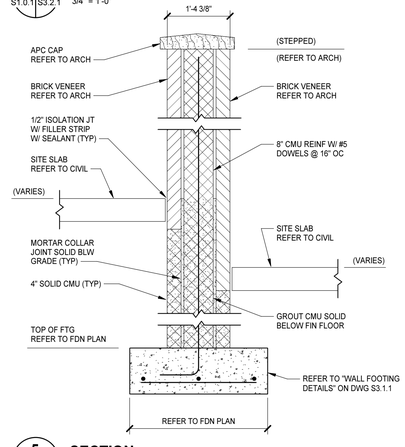
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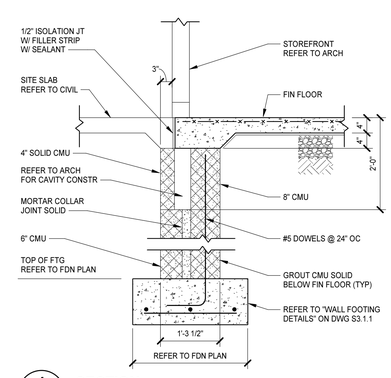
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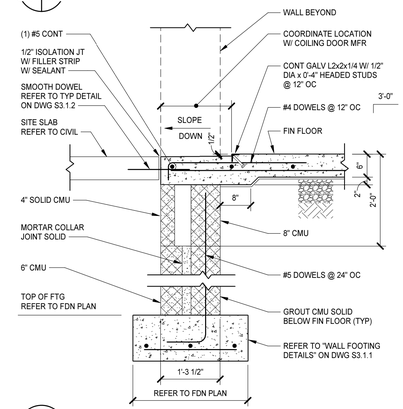
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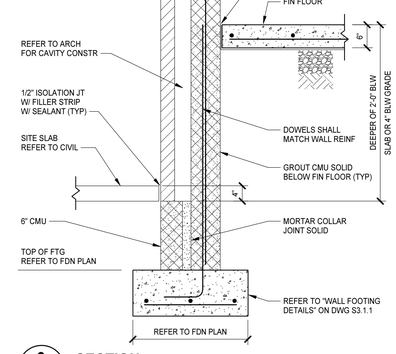
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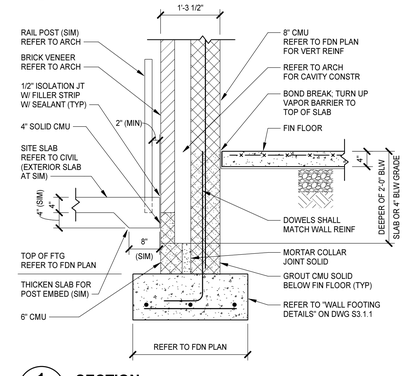
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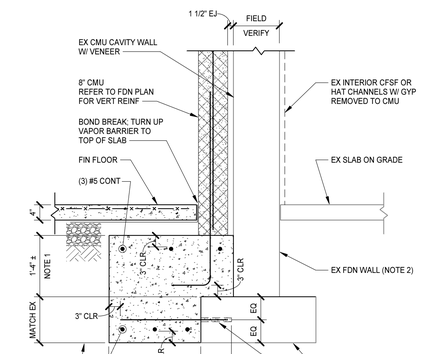
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2 SECTION S1.0.1 S3.2.1 — 3/4" = 1'-0"



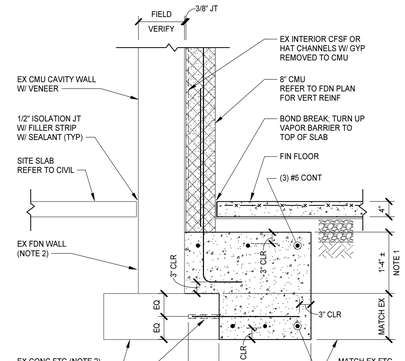
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Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
Jeffrey S. O'Beirne
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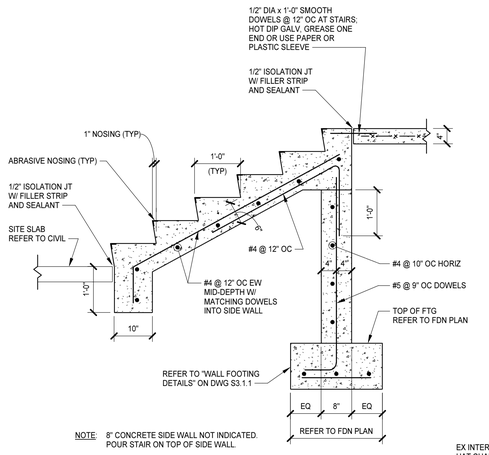
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS
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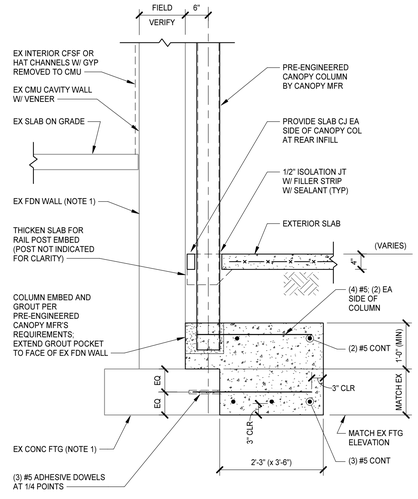
S3.2.1

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NOTE: 8" CONCRETE SIDE WALL NOT INDICATED. POUR STAIR ON TOP OF SIDE WALL.

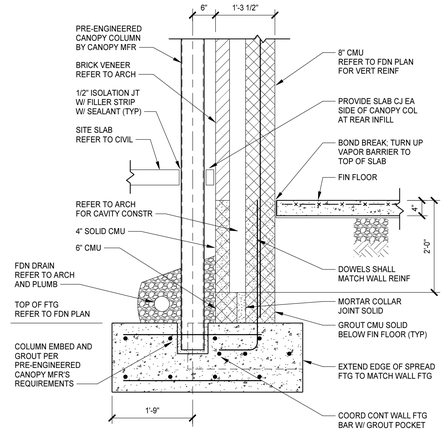
16 S1.0.1 | S3.2.2 **SECTION** 3/4" = 1'-0"



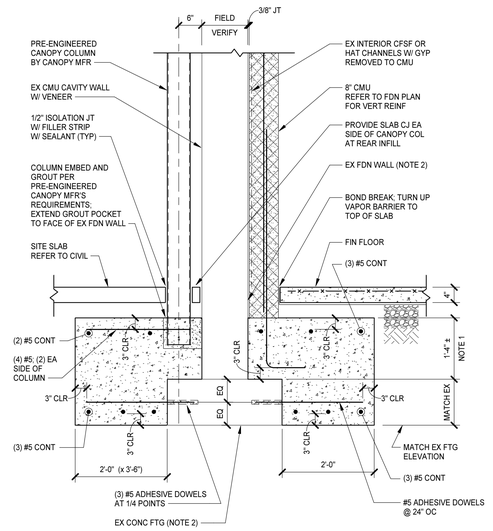
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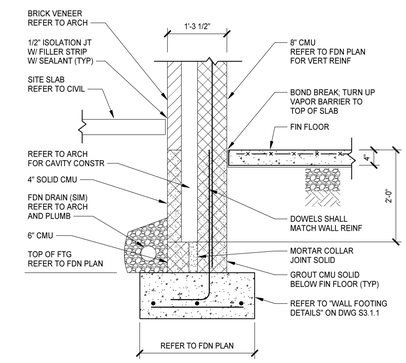


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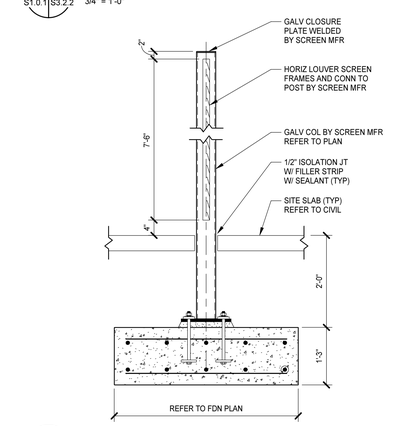
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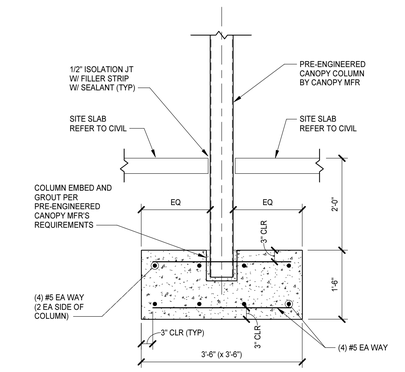
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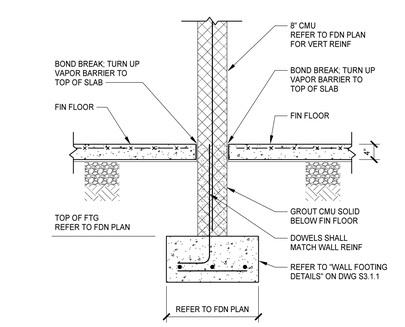
8 S1.0.1 | S3.2.2 **SECTION** 3/4" = 1'-0"



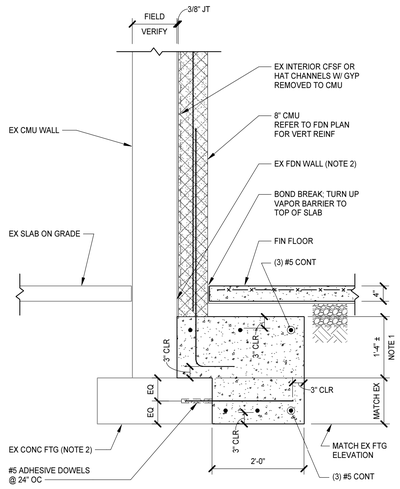
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6 S1.0.1 | S3.2.2 **SECTION** 3/4" = 1'-0"



5 S1.0.1 | S3.2.2 **SECTION** 3/4" = 1'-0"

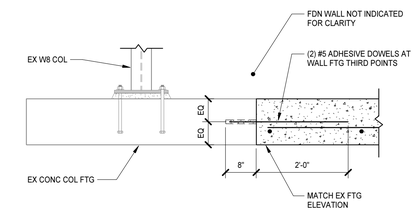


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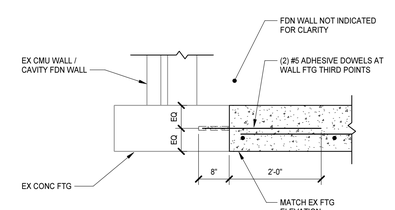
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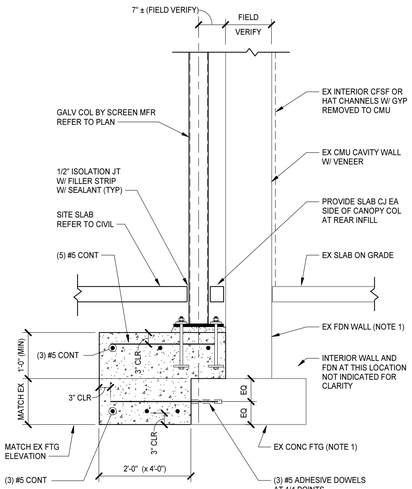
3 S1.0.1 | S3.2.2 **SECTION** 3/4" = 1'-0"



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1 S1.0.1 | S3.2.2 **SECTION** 3/4" = 1'-0"

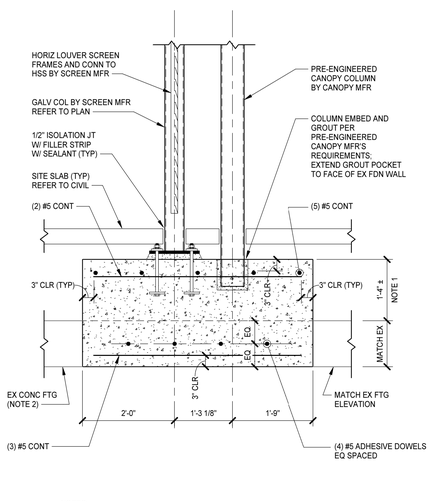


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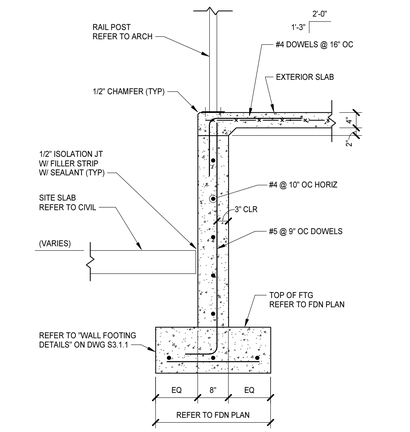
14 S1.0.1 | S3.2.2 **SECTION** 3/4" = 1'-0"



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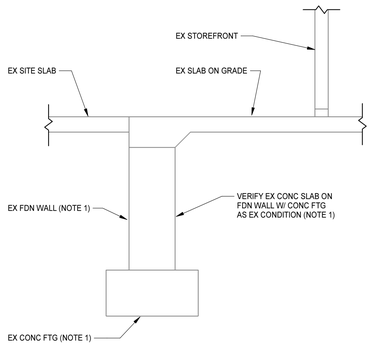
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SUBMITTAL: BID SET

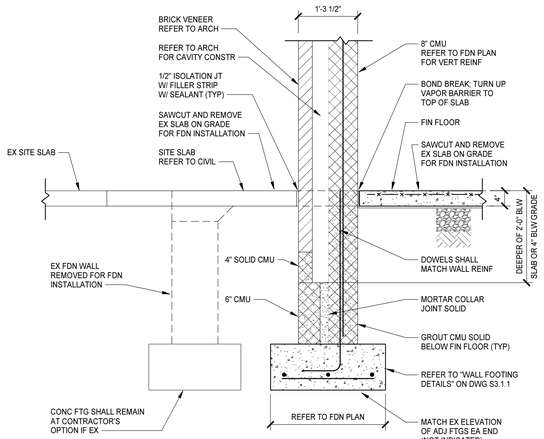
REVISIONS	
DATE	DESCRIPTION

FOUNDATION SECTIONS

S3.2.2

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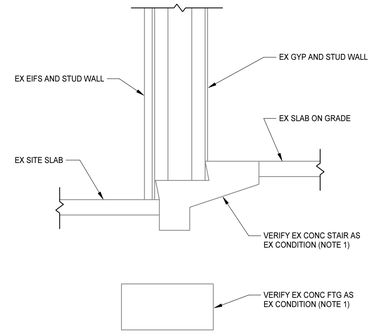


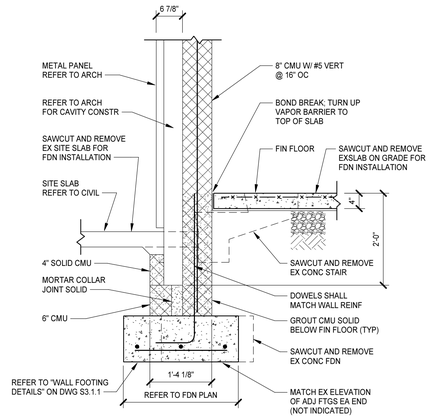
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EXISTING CONSTRUCTION

4 SECTION
S1.0.1 | S3.2.3 3/4" = 1'-0"



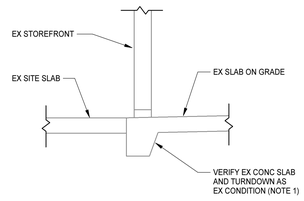


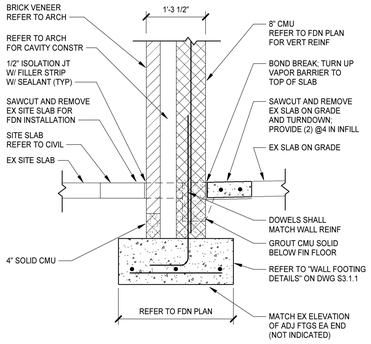
NOTES:

1. BELOW GRADE EXISTING FDN INFORMATION WAS UNAVAILABLE. FIELD VERIFY EXISTING CONDITIONS. REFER TO "RENOVATION" NOTE ON DRAWING S0.1.1.

EXISTING CONSTRUCTION

2 SECTION
S1.0.1 | S3.2.3 3/4" = 1'-0"



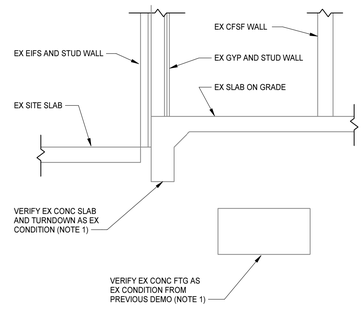


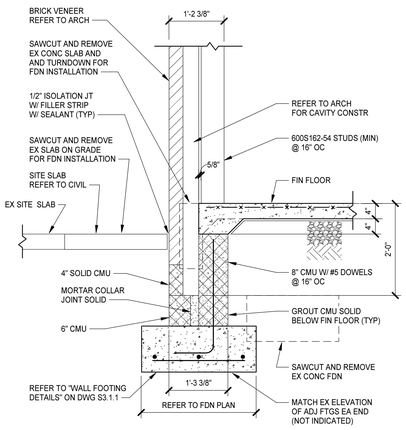
NOTES:

1. BELOW GRADE EXISTING FDN INFORMATION WAS UNAVAILABLE. FIELD VERIFY EXISTING CONDITIONS. REFER TO "RENOVATION" NOTE ON DRAWING S0.1.1.

EXISTING CONSTRUCTION

3 SECTION
S1.0.1 | S3.2.3 3/4" = 1'-0"





NOTES:

1. BELOW GRADE EXISTING FDN INFORMATION WAS UNAVAILABLE. FIELD VERIFY EXISTING CONDITIONS. REFER TO "RENOVATION" NOTE ON DRAWING S0.1.1.

EXISTING CONSTRUCTION

1 SECTION
S1.0.1 | S3.2.3 3/4" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

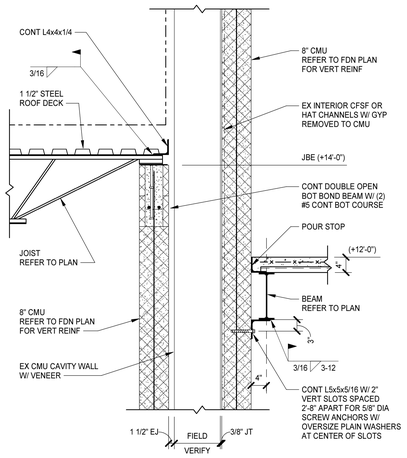
PROJECT NO: 651033	DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET	

REVISIONS	
DATE	DESCRIPTION

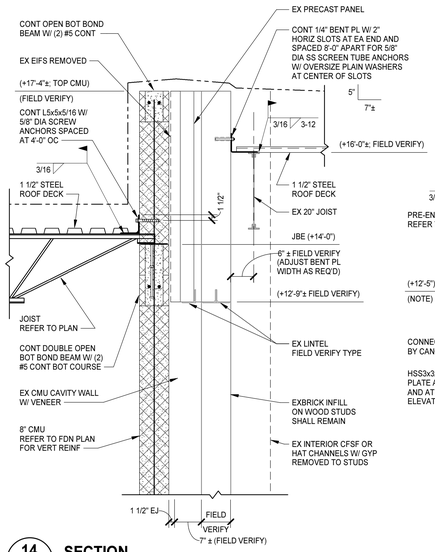
FOUNDATION SECTIONS

S3.2.3

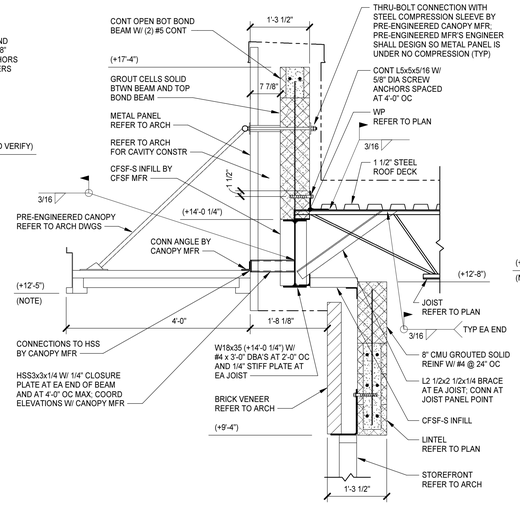
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17 S1.1.1 S3.3.1 **SECTION** 3/4" = 1'-0"

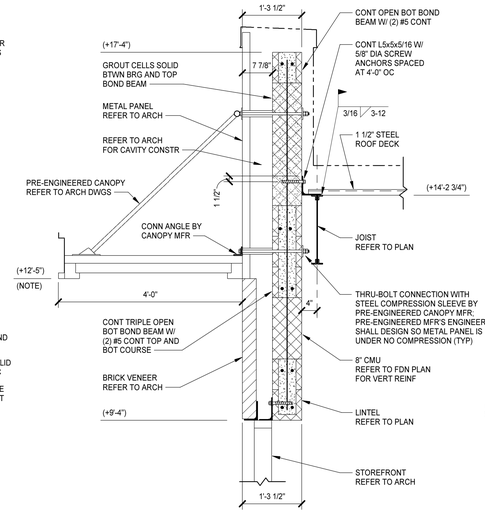


14 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



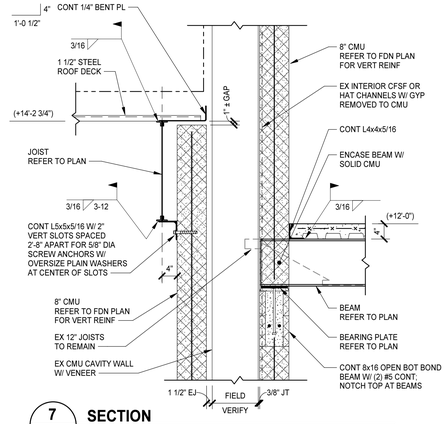
NOTE: FIELD VERIFY ELEVATION OF CANOPY REQUIRED TO PASS ABOVE EXISTING EXTERIOR BRICK PILASTERS. THIS ELEVATION SHALL REMAIN CONSTANT AT THE HIGH PERIMETER TENSION ROD CANOPIES.

11 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



NOTE: FIELD VERIFY ELEVATION OF CANOPY REQUIRED TO PASS ABOVE EXISTING EXTERIOR BRICK PILASTERS. THIS ELEVATION SHALL REMAIN CONSTANT AT THE HIGH PERIMETER TENSION ROD CANOPIES.

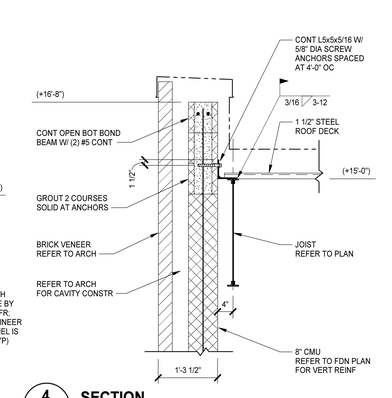
8 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



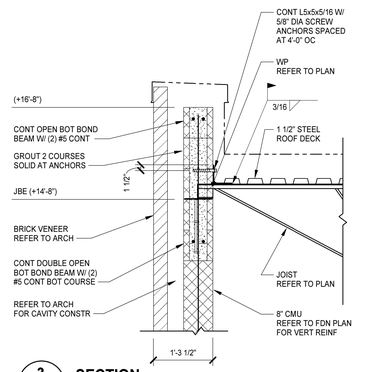
7 S1.1.1 S3.3.1 **SECTION** 3/4" = 1'-0"

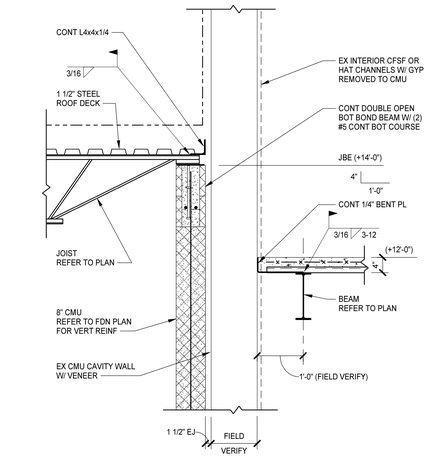
NOTE: FIELD VERIFY ELEVATION OF CANOPY REQUIRED TO PASS ABOVE EXISTING EXTERIOR BRICK PILASTERS. THIS ELEVATION SHALL REMAIN CONSTANT AT THE HIGH PERIMETER TENSION ROD CANOPIES.

4 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"

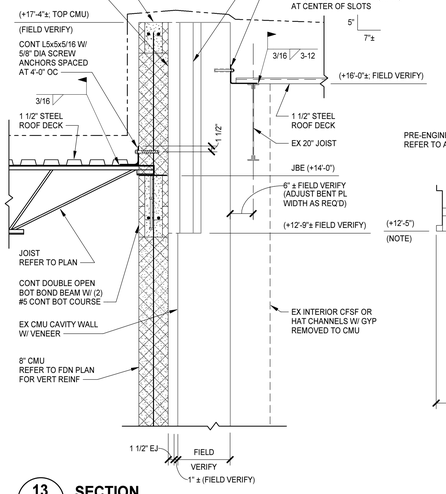


3 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"

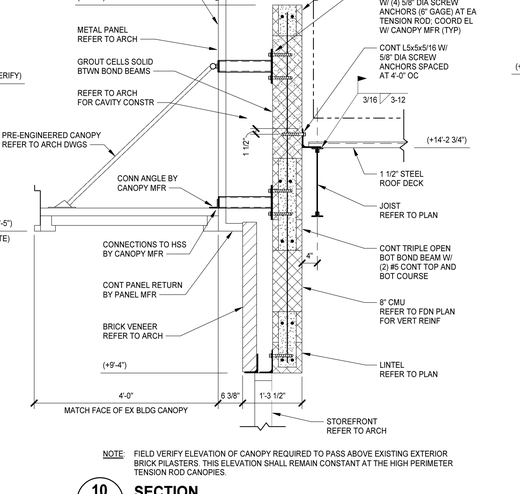




16 S1.1.1 S3.3.1 **SECTION** 3/4" = 1'-0"

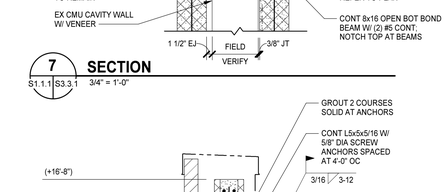


13 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"

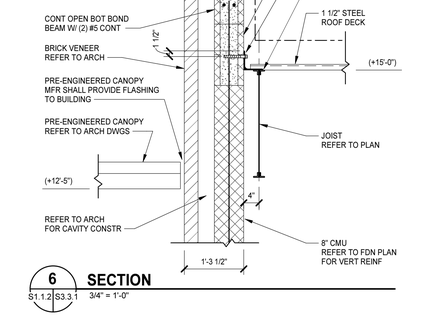


NOTE: FIELD VERIFY ELEVATION OF CANOPY REQUIRED TO PASS ABOVE EXISTING EXTERIOR BRICK PILASTERS. THIS ELEVATION SHALL REMAIN CONSTANT AT THE HIGH PERIMETER TENSION ROD CANOPIES.

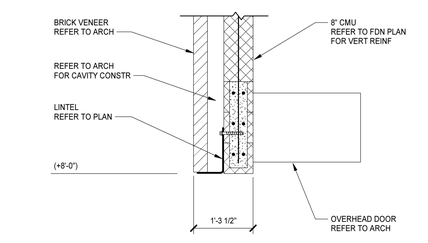
10 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



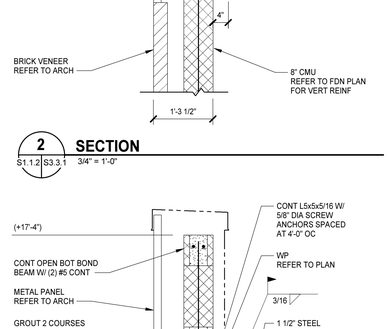
9 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



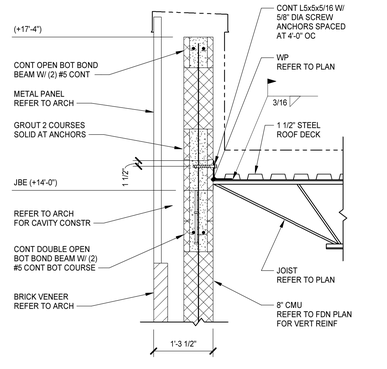
6 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



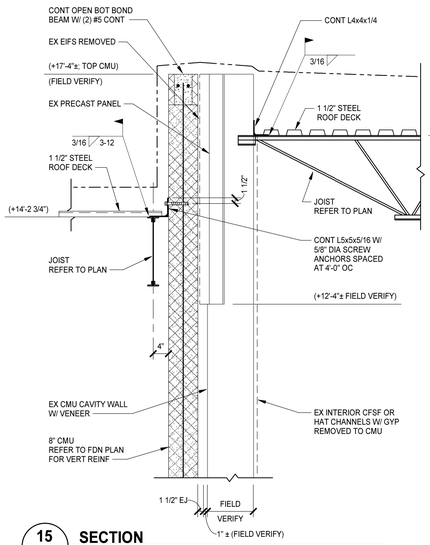
5 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



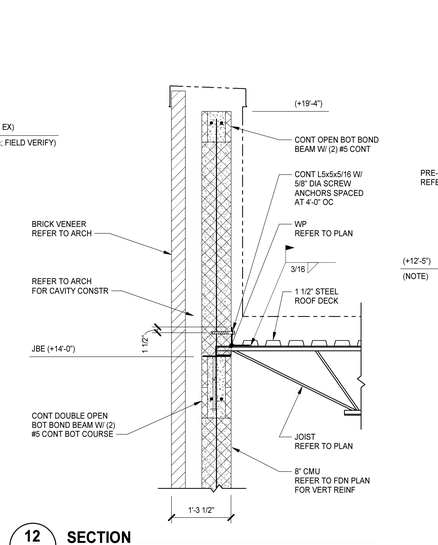
2 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



15 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



12 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"



9 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"

1 S1.1.2 S3.3.1 **SECTION** 3/4" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
JEFFREY S. O'BEIRNE
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10/21/26
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DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

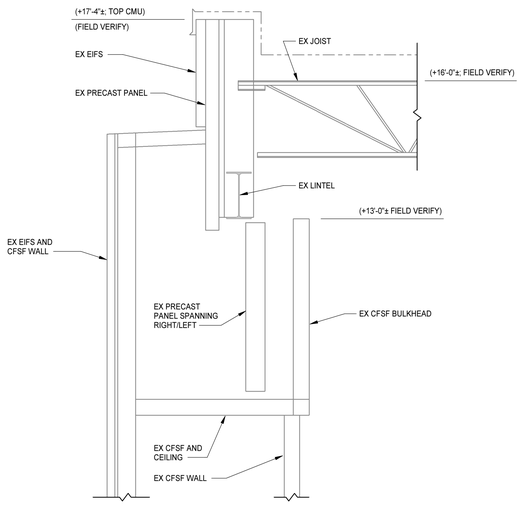
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

FRAMING SECTIONS

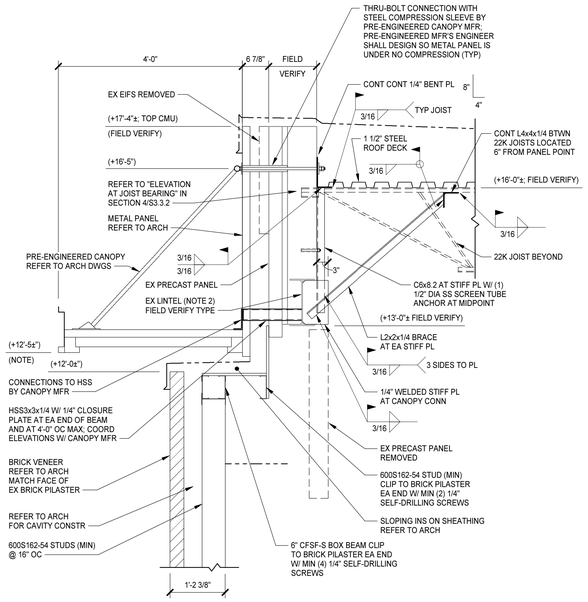
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EXISTING CONSTRUCTION

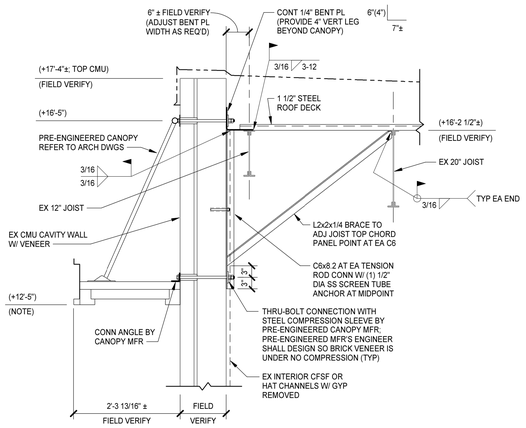
5 SECTION S1.1.2 | S3.3.2 3/4" = 1'-0"



NOTES:

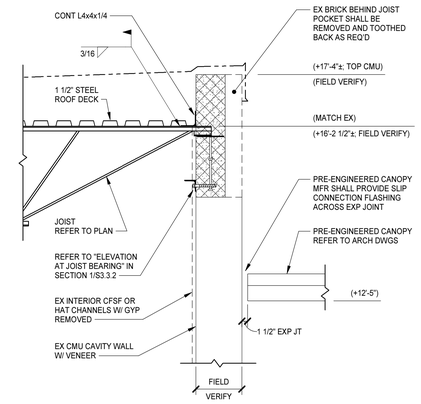
1. FIELD VERIFY ELEVATION OF CANOPY REQUIRED TO PASS ABOVE EXISTING EXTERIOR BRICK PILASTERS. THIS ELEVATION SHALL REMAIN CONSTANT AT THE HIGH PERIMETER TENSION ROD CANOPIES.
2. FIELD VERIFY EXISTING LINTEL TYPE AND CONTACT ENGINEER IF LINTEL IS NOT WIDE FLANGE BEAM FOR CONNECTION MODIFICATIONS.

AT EA CANOPY TENSION ROD

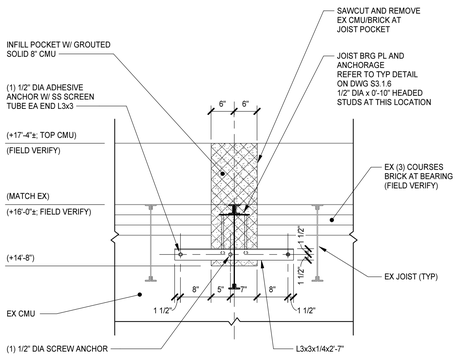


NOTE: SHALL FIELD VERIFY ELEVATION OF CANOPY REQUIRED TO PASS ABOVE EXISTING EXTERIOR BRICK PILASTERS. THIS ELEVATION SHALL REMAIN CONSTANT AT THE HIGH PERIMETER TENSION ROD CANOPIES.

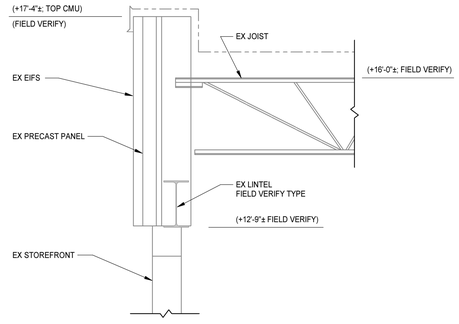
3 SECTION S1.1.2 | S3.3.2 3/4" = 1'-0"



2 SECTION S1.1.2 | S3.3.2 3/4" = 1'-0"

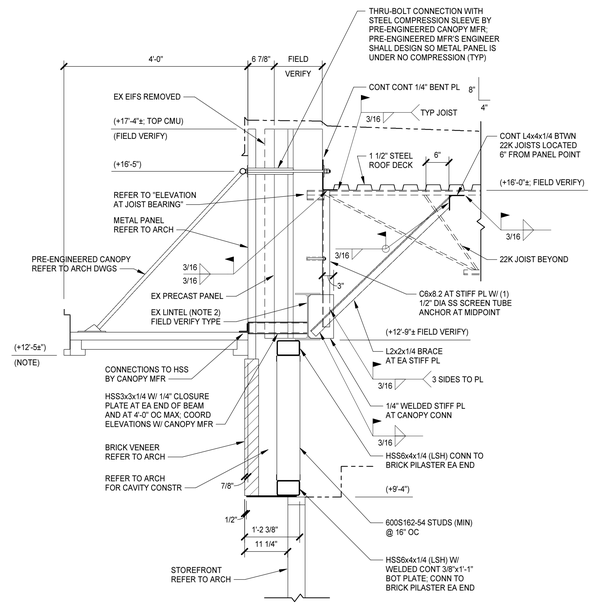


ELEVATION AT JOIST BEARING



EXISTING CONSTRUCTION

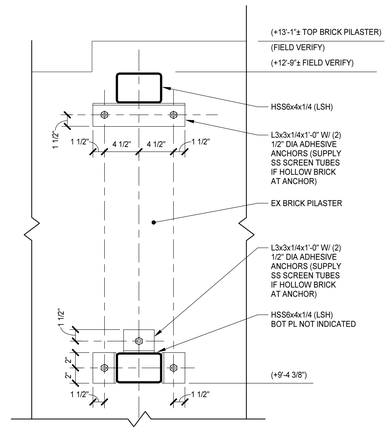
4 SECTION S1.1.2 | S3.3.2 3/4" = 1'-0"



NOTES:

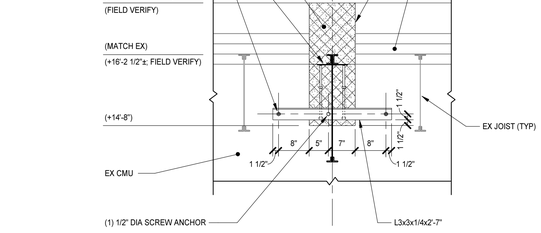
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2. FIELD VERIFY EXISTING LINTEL TYPE AND CONTACT ENGINEER IF LINTEL IS NOT WIDE FLANGE BEAM FOR CONNECTION MODIFICATIONS.

AT EA CANOPY TENSION ROD

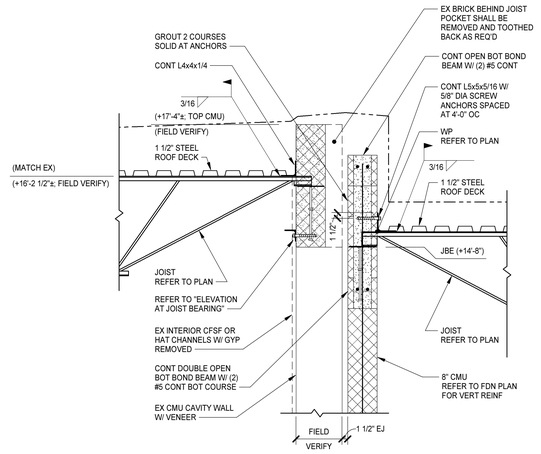


BRICK PILASTER CONNECTIONS

1 1/2" = 1'-0"



ELEVATION AT JOIST BEARING



1 SECTION S1.1.2 | S3.3.2 3/4" = 1'-0"

Moseley
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PHONE (804) 794-7555
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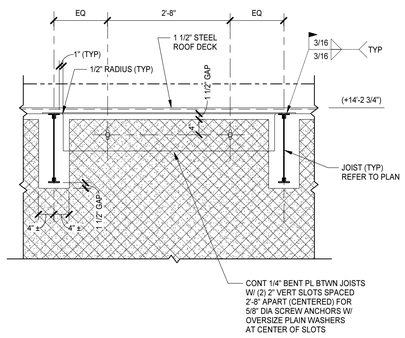
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

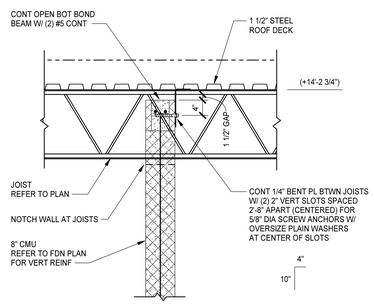
FRAMING SECTIONS

S3.3.2

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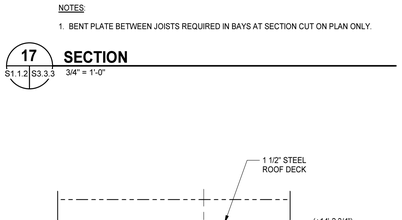
CMU ELEVATION



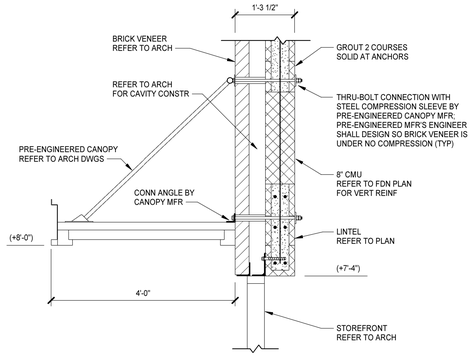
NOTES:

1. BENT PLATE BETWEEN JOISTS REQUIRED IN BAYS AT SECTION CUT ON PLAN ONLY.

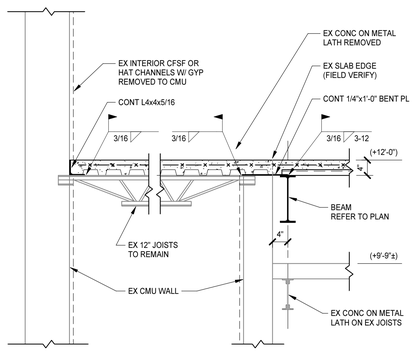
17 S1.1.2 | S3.3.3 **SECTION** 3/4" = 1'-0"



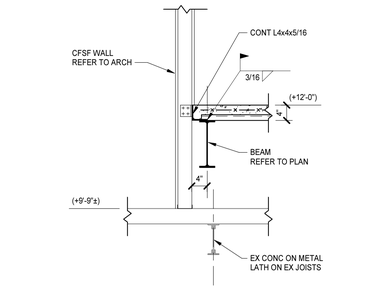
16 S1.1.2 | S3.3.3 **SECTION** 3/4" = 1'-0"



15 S1.1.2 | S3.3.3 **SECTION** 3/4" = 1'-0"

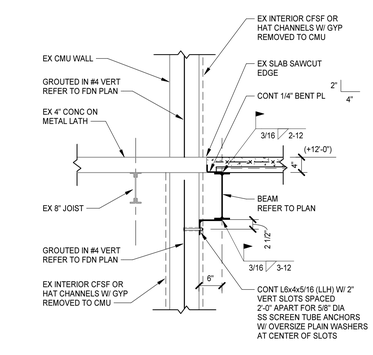


14 S1.1.1 | S3.3.3 **SECTION** 3/4" = 1'-0"

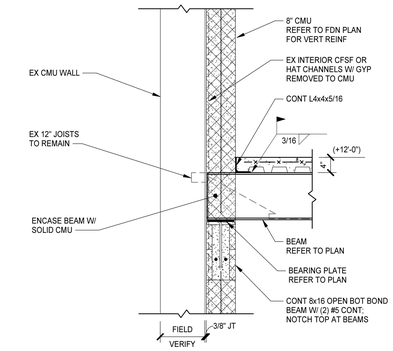


13 S1.1.1 | S3.3.3 **SECTION** 3/4" = 1'-0"

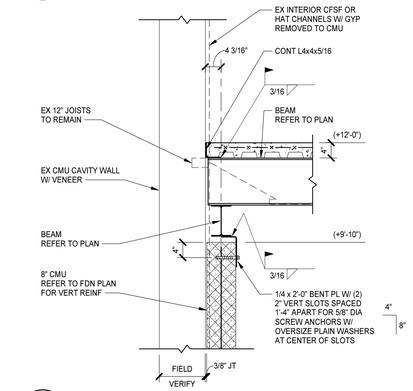
12 S1.1.2 | S3.3.3 **SECTION** 3/4" = 1'-0"



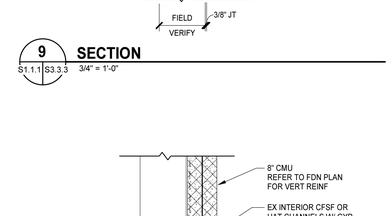
11 S1.1.1 | S3.3.3 **SECTION** 3/4" = 1'-0"



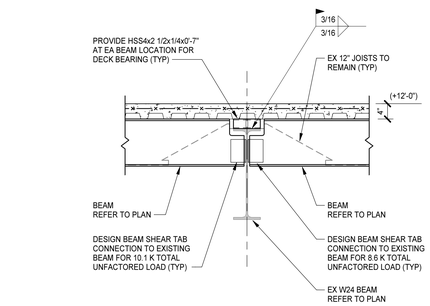
10 S1.1.1 | S3.3.3 **SECTION** 3/4" = 1'-0"



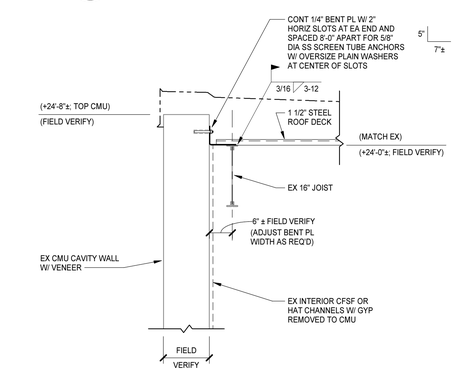
9 S1.1.1 | S3.3.3 **SECTION** 3/4" = 1'-0"



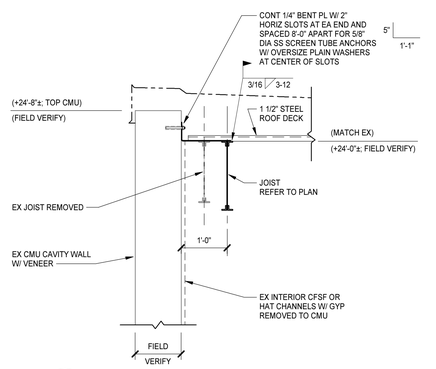
7 S1.1.1 | S3.3.3 **SECTION** 3/4" = 1'-0"



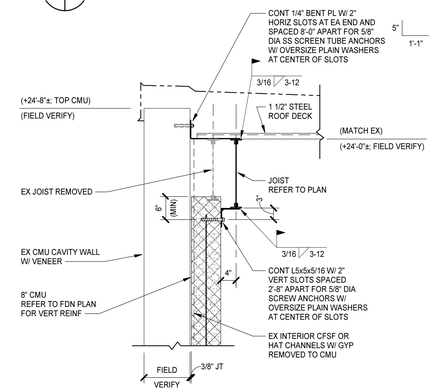
6 S1.1.1 | S3.3.3 **SECTION** 3/4" = 1'-0"



5 S1.1.2 | S3.3.3 **SECTION** 3/4" = 1'-0"



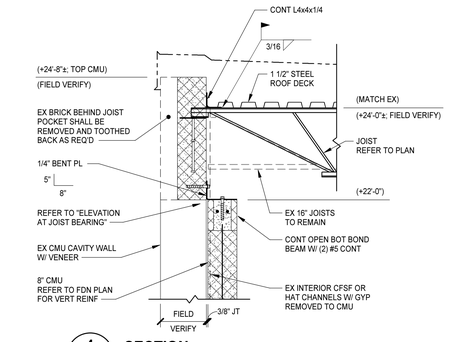
3 S1.1.2 | S3.3.3 **SECTION** 3/4" = 1'-0"



2 S1.1.2 | S3.3.3 **SECTION** 3/4" = 1'-0"



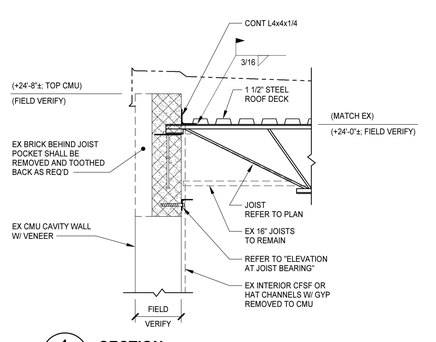
ELEVATION AT JOIST BEARING



4 S1.1.2 | S3.3.3 **SECTION** 3/4" = 1'-0"



ELEVATION AT JOIST BEARING



1 S1.1.2 | S3.3.3 **SECTION** 3/4" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
Jeffrey S. O'Beirne
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/25
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

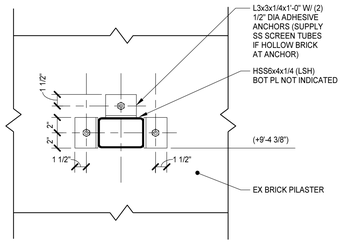
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
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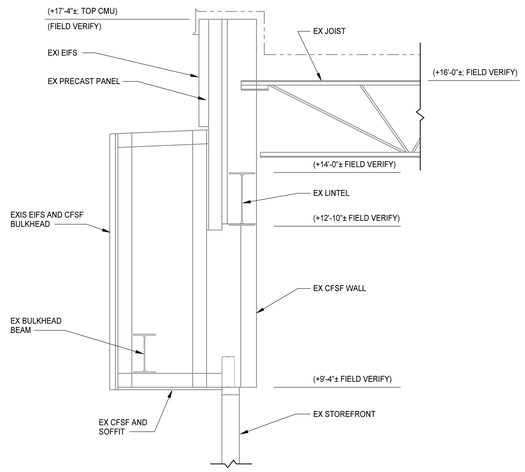
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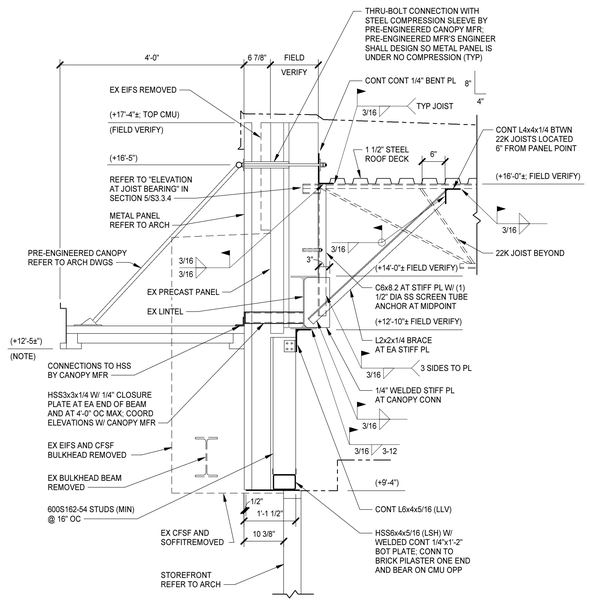


BRICK PILASTER CONNECTION

1 1/2" = 1'-0"

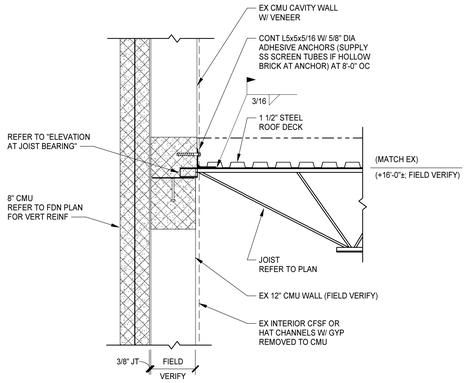


EXISTING CONSTRUCTION



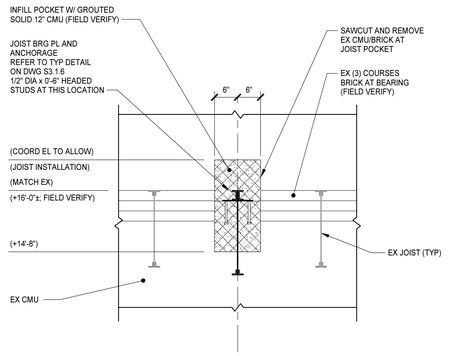
NOTE: FIELD VERIFY ELEVATION OF CANOPY REQUIRED TO PASS ABOVE EXISTING EXTERIOR BRICK PILASTERS. THIS ELEVATION SHALL REMAIN CONSTANT AT THE HIGH PERIMETER TENSION ROD CANOPIES.

AT EA CANOPY TENSION ROD

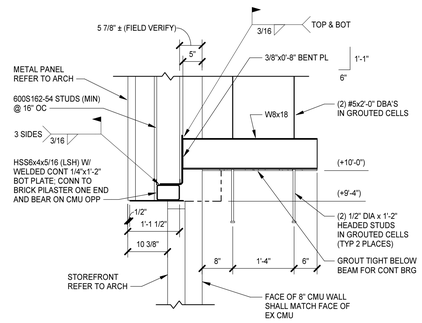


3 S1.1.2 | S3.3.4 **SECTION**

3/4" = 1'-0"

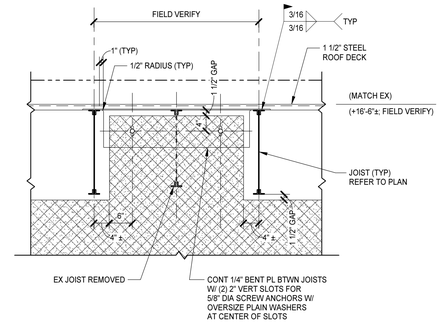


ELEVATION AT JOIST BEARING

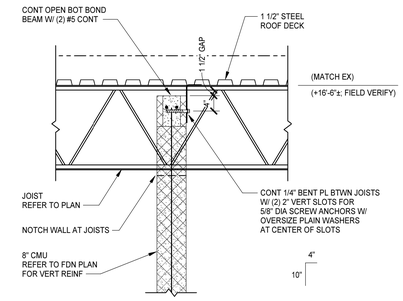


4 S1.1.2 | S3.3.4 **SECTION**

3/4" = 1'-0"



CMU ELEVATION

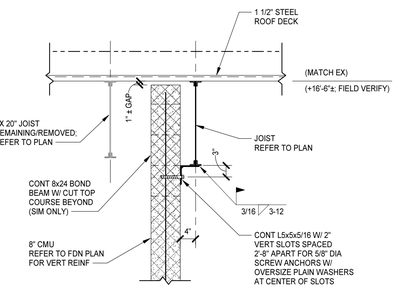


NOTES:

1. BENT PLATE BETWEEN JOISTS REQUIRED IN BAYS AT SECTION CUT ON PLAN ONLY.

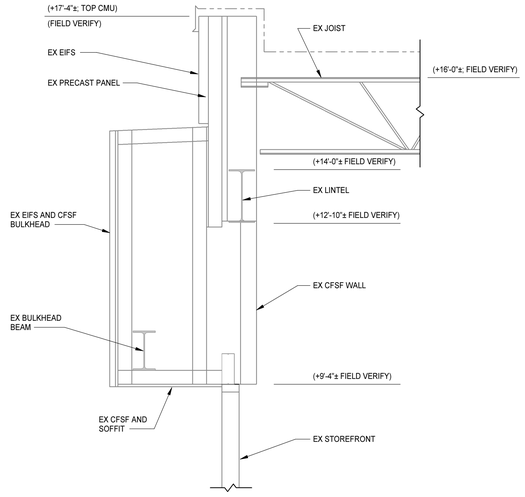
2 S1.1.2 | S3.3.4 **SECTION**

3/4" = 1'-0"

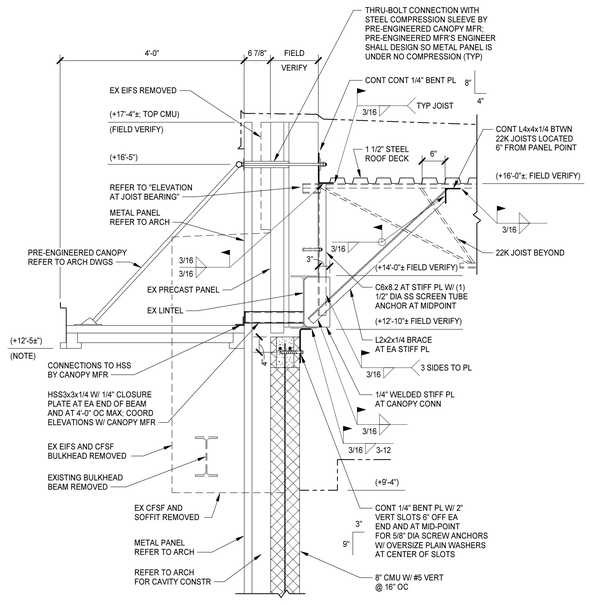


1 S1.1.2 | S3.3.4 **SECTION**

3/4" = 1'-0"

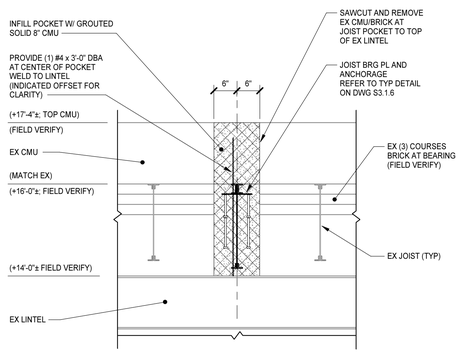


EXISTING CONSTRUCTION



NOTE: FIELD VERIFY ELEVATION OF CANOPY REQUIRED TO PASS ABOVE EXISTING EXTERIOR BRICK PILASTERS. THIS ELEVATION SHALL REMAIN CONSTANT AT THE HIGH PERIMETER TENSION ROD CANOPIES.

AT EA CANOPY TENSION ROD



ELEVATION AT JOIST BEARING

5 S1.1.2 | S3.3.4 **SECTION**

3/4" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

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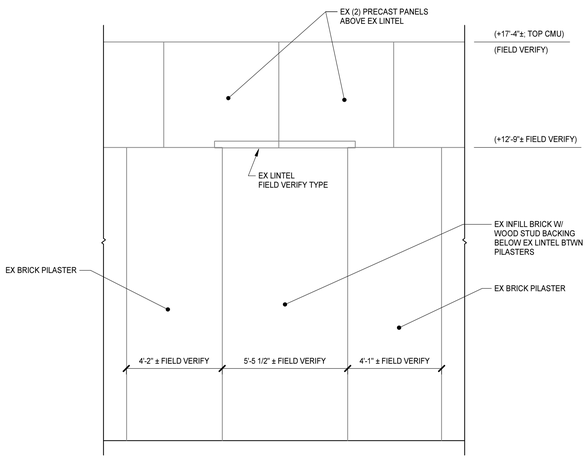
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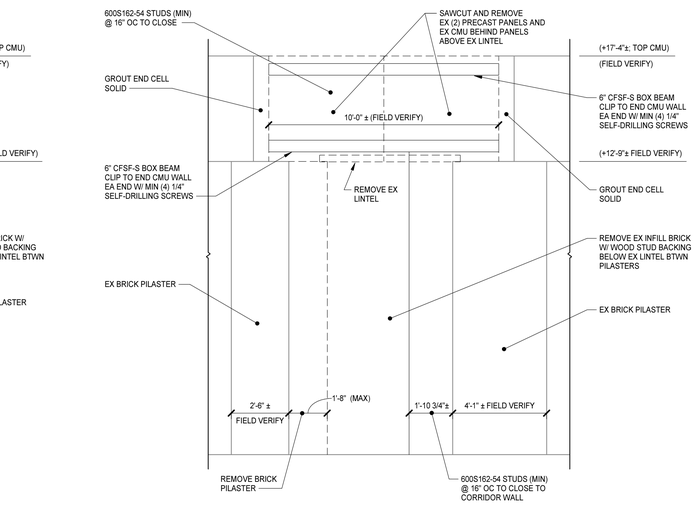
S3.3.4

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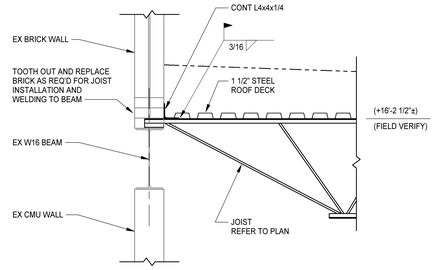


EXISTING CONSTRUCTION

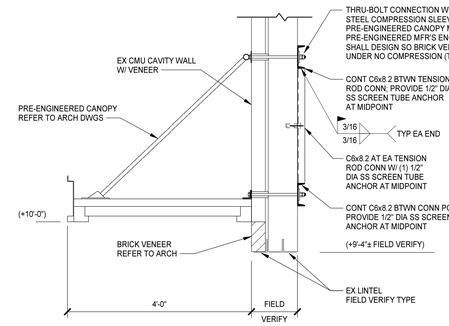
7 SECTION
S1.1.2 | S3.3.5 — 3/8" = 1'-0"

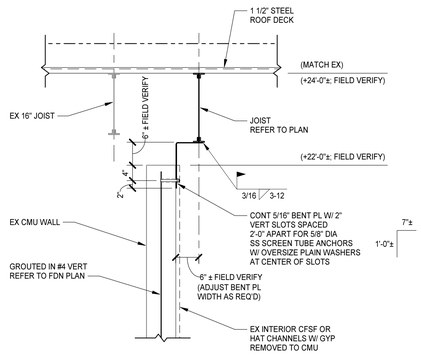


4 SECTION
S1.1.2 | S3.3.5 — 3/4" = 1'-0"

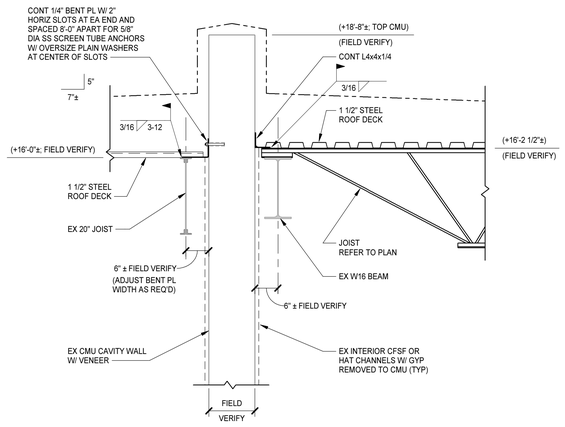


3 SECTION
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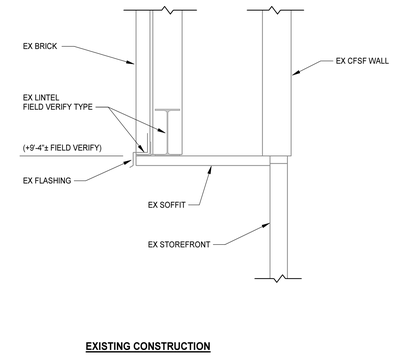




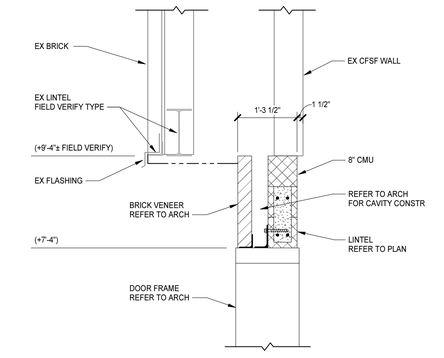
6 SECTION
S1.1.2 | S3.3.5 — 3/4" = 1'-0"



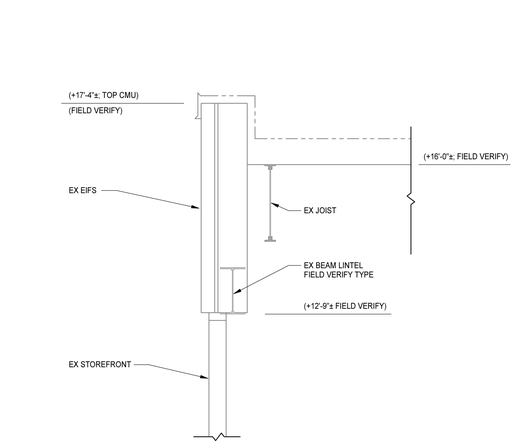
5 SECTION
S1.1.2 | S3.3.5 — 3/4" = 1'-0"



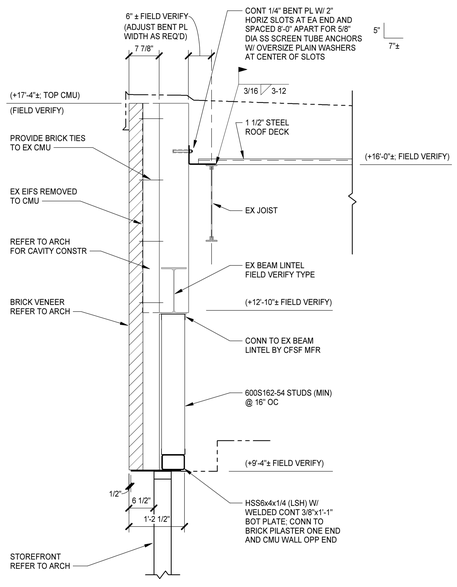
EXISTING CONSTRUCTION



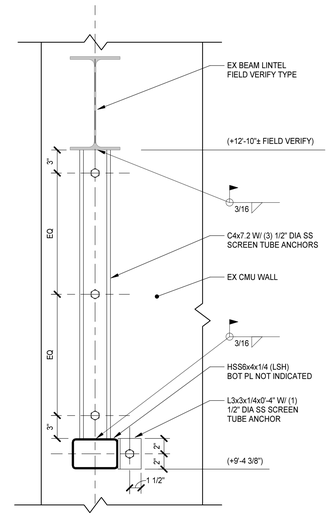
2 SECTION
S1.1.2 | S3.3.5 — 3/4" = 1'-0"



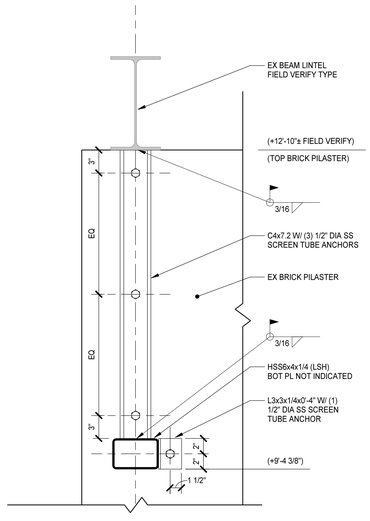
EXISTING CONSTRUCTION



1 SECTION
S1.1.2 | S3.3.5 — 3/4" = 1'-0"



CMU WALL CONNECTIONS



BRICK PILASTER CONNECTIONS

NOTE: REMOVE EXISTING BRICK VENEER FOR DIRECT C4 CONNECTION TO EXISTING CMU. C4 SHALL NOT BE CONNECTED TO EXISTING BRICK VENEER.

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
JEFFREY S. O'BEIRNE
Lic. No. 036947
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

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S3.3.5

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ABBREVIATIONS

@	AT
AAV	AIR ADMITTANCE VALVE
ABV	ABOVE
AC/AC-X	AIR COMPRESSOR DESIGNATION
AD/AD-X	AREA DRAIN
ADJ	ADJUSTABLE
ADNL	ADDITIONAL
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
ALUM	ALUMINUM
AP	ACCESS PANEL
APPR/APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
AUTO	AUTOMATIC
AV	ACID VENT
AVG	AVERAGE
AW	ACID WASTE
BFF	BELOW FINISHED FLOOR
BFG	BELOW FINISHED GRADE
BFP/BFP-X	BACKFLOW PREVENTER
BLDG	BUILDING
BO	BOTTOM OF
BOT	BOTTOM
BSMT	BASEMENT
BT/BT-X	BATHTUB
BTWN	BETWEEN
CA	COMPRESSED AIR
CFCI	CONTRACTOR FURNISHED CONTRACTOR INSTALLED
CFM	CUBIC FEET PER MINUTE
CI	CAST IRON
CIP	CAST-IN-PLACE CONCRETE
CL	CENTERLINE
CLG	CEILING
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CNTR	COUNTER
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
CONDS	CONDENSATE
CONSTR	CONSTRUCT(ION)
CONT	CONTINUATION
CONTR	CONTRACT(OR)
CORR	CORRIDOR
CP/CP-X	CIRCULATING PUMP
CPVC	CHLORINATED POLYVINYL CHLORIDE
CR	CLASSROOM
CT	COOLING TOWER
CU	COPPER
CU FT	CUBIC FEET
CU YD	CUBIC YARD
CW	COLD WATER
DB	DRY BULB
DCW	DOMESTIC COLD WATER
DEMO	DEMOLISH OR DEMOLITION
DF/DF-X	DRINKING FOUNTAIN
DHR	DOMESTIC HOT WATER RETURN
DHR(140)	DOMESTIC HOT WATER RETURN (140°F)
DHR(160)	DOMESTIC HOT WATER RETURN (160°F)
DHW	DOMESTIC HOT WATER
DHW(140)	DOMESTIC HOT WATER (140°F)
DHW(160)	DOMESTIC HOT WATER (160°F)
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DN	DOWN
DR/DR-X	COMPRESSED AIR DRYER
DS	DOWNSPOUT
DT	DRAIN TILE
DTL	DETAIL
DTW	DOMESTIC TEMPERED WATER
DWG/DWGS	DRAWING/DRAWINGS
DWP/DWP-X	DOMESTIC WATER BOOSTER PUMP
E	EAST
EA	EACH
ED	EMERGENCY SECONDARY ROOF DRAIN
EEWS	EMERGENCY COMBINATION EYEWASH/SHOWER
ELEC/ELECT	ELECTRICAL
ELEV	ELEVATION
EPBD	ELECTRICAL PANELBOARD
EQ	EQUAL
EQUIP	EQUIPMENT
ET/ET-X	EXPANSION TANK
ETR	EXISTING TO REMAIN
EWEEW	EMERGENCY EYEWASH
EWC/EWC-X	ELECTRIC WATER COOLER
EWH/EWH-X	ELECTRIC WATER HEATER
EX	EXISTING
EXP	EXPANSION
FCO	FLOOR CLEANOUT
FD/FD-X	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FF	FINISHED FLOOR
FFE	FINISHED FLOOR ELEVATION
FG	FINISHED GRADE
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHS	FIRE HOSE STATION
FHVC	FIRE HOSE VALVE CABINET
FIX/FIXT	FIXTURE
FL/FLR	FLOOR
FLSHG	FLASHING
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FOV	FUEL OIL VENT
FS/FS-X	FLOOR SINK
FSD	FOUNDATION SUB-DRAIN
FT	FOOT OR FEET
FVC	FIRE VALVE CABINET
G	GAS
GCO	GRADE CLEANOUT
GPM	GALLONS PER MINUTE
GR/GR-X	GAS REGULATOR
GS/GS-X	GREASE INTERCEPTOR/SEPARATOR
GWH/GWH-X	GAS WATER HEATER
HB/HB-X	HOSE BIBB
HORIZ	HORIZONTAL
HP	HORSEPOWER
HR/HR-X	HOSE REEL
HT/HT-X	HYDRO-PNEUMATIC TANK
HTG	HEATING
HW	HOT WATER
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HZ	HERTZ
ID	INSIDE DIAMETER
IN	INCH
INSUL	INSULATE OR INSULATION
INV	INVERT
INV.ELEV.	INVERT ELEVATION
JAN	JANITOR
KIT	KITCHEN
KPA	KILOPASCALS
KS/KS-X	KITCHEN SINK
KW	KITCHEN WASTE
KW	KILOWATT
LAV/LA-X	LAVATORY
LAB	LABORATORY
LAV	LAVATORY
LBS	POUNDS
LF	LINEAR FOOT (FEET)
LP/LPG	PROPANE
LPM	LITERS PER MINUTE
LPV	PROPANE VENT
MATL	MATERIAL
MAX	MAXIMUM
MB/MB-X	MOP BASIN
MECH	MECHANICAL
MED	MEDIUM
MFR/MFGR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
N	NORTH
N/A	NOT APPLICABLE/AVAILABLE
NC	NORMALLY CLOSED
NG	NATURAL GAS
NGV	NATURAL GAS VENT
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO.. (#)	NUMBER
NOM	NOMINAL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFF	OFFICE
OH	OVERHEAD
OPNG	OPENING
OPP	OPPOSITE
OS/OS-X	OIL INTERCEPTOR/SEPARATOR
OSD	OPEN SITE DRAIN
P.D.	PRESSURE DIFFERENTIAL
PC	PRECAST
PCF	POUNDS PER CUBIC FOOT
PD	PUMP DISCHARGE
PDT/PDT-X	PENAL/SECURITY DETOX TOILET
PE	POLYETHYLENE
PLA/PLA-X	PENAL/SECURITY LAVATORY
PLUMB	PLUMBING
PLYWD	PLYWOOD
POLY	POLYETHYLENE
PP	POLYPROPYLENE
PP-RCT	POLYPROPYLENE - RANDOM COPOLYMER, CRYSTALLINITY, & TEMPERATURE
PPT	PRESSURE PRESERVATIVE TREATED
PREFAB	PREFABRICATE(D)
PROJ	PROJECT
PSF	POUNDS PER SQUARE FOOT
PSH/PSH-X	PEANL/SECURITY SHOWER
PSI	POUNDS PER SQUARE INCH
PV	PROPANE VENT
PVC	POLYVINYL CHLORIDE
PVDF	POLYVINYLIDENE FLUORIDE
PVMT	PAVEMENT
PWA/PWA-X	PENAL/SECURITY COMBINATION FIXTURE
PWC/PWC-X	PENAL/SECURITY WATER CLOSET
R	RISER
RAD	RADIUS
RCP/RCP-X	RECIRCULATION PUMP
RD/RD-X	ROOF DRAIN (BOTTOM OUTLET)
RDS/RDS-X	ROOF DRAIN (SIDE OUTLET)
REF	REFERENCE
REG	REGULAR
REQD	REQUIRED
REQMT	REQUIREMENTS
RH/RH-X	ROOF HYDRANT
RL	RAIN LEADER
RM	ROOM
RO	ROUGH OPENING
RV	RADON VENT
S	SOUTH
SAN	SANITARY
SCH	SCHEDULE
SD	STORM DRAINAGE PIPING
SDN	STORM DRAIN NOZZLE
SF	SQUARE FOOT/FEET
SHT	SHEET
SIM	SIMILAR
SK/SK-X	SINK
SLT	SEALANT
SOG	SLAB ON GRADE
SOV	SHUTOFF VALVE(S)
SP	SUMP PUMP
SPEC	SPECIFICATION
SPR	SPRINKLER
SQ	SQUARE
SRD	SECONDARY ROOF DRAIN
SS	STAINLESS STEEL
SS/SS-X	SOLIDS INTERCEPTOR/SEPARATOR
SSD	SECONDARY STORM DRAINAGE PIPING
ST/ST-X	STORAGE TANK
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SUSP	SUSPENDED
TD	TRENCH DRAIN
THK	THICK(-NESS)
TLT	TOILET
TMV	THERMOSTATIC MIXING VALVE
TOSL	TOP OF SLAB
TW	DOMESTIC TEPID WATER (85°F)
TWR	DOMESTIC TEPID WATER RETURN (85°F)
TYP	TYPICAL
UG	UNDERGROUND
UNO	UNLESS NOTED (INDICATED) OTHERWISE
UR/UR-X	URINAL
V	VENT
V	VOLTS
VAC	VACUUM
VB	VACUUM BREAKER
VERT	VERTICAL
VIF	VERIFY IN FIELD
VP/VP-X	VACUUM PUMP
VTR	VENT THROUGH ROOF
W	WEST
W	WATTS
W/	WITH
W/O	WITHOUT
WB/WB-X	WASHER BOX
WC/WC-X	WATER CLOSET
WCO	WALL CLEANOUT
WH/WH-X	WALL HYDRANT
WHA/WHA-X	WATER HAMMER ARRESTOR
WSB/WSB-X	WATER SUPPLY BOX
WSHP	WATER SOURCE HEAT PUMP
WWF	WELDED WIRE FABRIC
WWM	WELDED WIRE MESH
XFMR	TRANSFORMER

GRAPHICS SYMBOLS LEGEND

- X" XXX — PIPE WITH SIZE AND SERVICE
- FLOW IN DIRECTION OF ARROW
- 1/8" FT — PITCH DOWN IN DIRECTION OF ARROW AT INDICATED SLOPE
- PIPE CAP
- PIPE TURNED DOWN
- PIPE TURNED UP
- PIPE TEE UP
- PIPE TEE DOWN
- UNION
- CONCENTRIC PIPE REDUCTION
- CO — END OF LINE CLEANOUT PLUG
- CO — FLOOR CLEANOUT
- WCO — WALL CLEANOUT
- CO (GCO) — YARD CLEANOUT (CLEANOUT TO GRADE)
- FD-1 — FLOOR DRAIN WITH TAG
- FS-1 — FLOOR SINK WITH TAG
- PRESSURE GAUGE WITH GAUGE VALVE
- LIQUID FILLED THERMOMETER
- A — WATER HAMMER ARRESTOR (PLUMBING & DRAINAGE INSTITUTE SIZE INDICATED)
- FS — FLOW SWITCH
- TEMPERATURE/PRESSURE PLUG
- VALVE
- VALVE IN RISER
- GAS VALVE
- VENTURI FLOW METER
- MANUAL BALANCING VALVE
- AUTOMATIC BALANCING VALVE WITH FLOW TAPS
- SWING CHECK VALVE
- PRESSURE REDUCING VALVE
- S — SOLENOID OPERATED VALVE
- T&P — TEMPERATURE AND PRESSURE RELIEF VALVE
- BACKWATER VALVE
- HOSE BIBB OR WALL HYDRANT
- REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER
- DOUBLE CHECK BACKFLOW PREVENTER
- PUMP

- POINT OF CONNECTION TO EXISTING
- LIMIT OF DEMOLITION
- 30 — KEYNOTE
- 8 — STRUCTURAL GRID LINE WITH DESIGNATION
- EX8 — EXISTING STRUCTURAL GRID LINE WITH DESIGNATION
- A123 — **SPACE IDENTIFICATION TAG**: SPACE NUMBER; BUILDING AREA (WHEN USED)
- AHU-02 — **EQUIPMENT IDENTIFICATION TAG**: EQUIPMENT NUMBER; UNIT DESIGNATION
- A / P6.1 — **SECTION WHERE CUT**: SECTION LETTER; DRAWING WHERE SECTION IS INDICATED
- 1 / P6.1 — **ENLARGED PLAN WHERE CUT**: ENLARGED PLAN NUMBER; DRAWING WHERE ENALRGED PLAN IS INDICATED
- 1 / P6.1 — **DETAIL TAG**: DETAIL NUMBER; DRAWING WHERE DETAIL IS INDICATED
- S1 / P6.1 — **SANITARY RISER TAG**: SANITARY RISER IDENTIFIER; DRAWING WHERE SANITARY RISER IS TAGGED
- D1 / P6.1 — **DOMESTIC RISER TAG**: DOMESTIC RISER IDENTIFIER; DRAWING WHERE DOMESTIC RISER IS TAGGED

1 DETAIL TITLE — 1/4"=1'-0"
- P2.2 / P6.2 — DETAIL NUMBER
- P2.3 — DRAWING WHERE DETAIL IS INDICATED
- P2.4 — DRAWING WHERE DETAIL IS CUT
- ADDITIONAL DRAWING REFERENCES

S1 SANITARY RISER DIAGRAM — 1/4"=1'-0"
- P2.2 / P4.2 — SANITARY RISER DIAGRAM IDENTIFIER
- P2.3 — DRAWING WHERE SANITARY RISER IS INDICATED
- P2.4 — DRAWING WHERE SANITARY RISER IS TAGGED
- ADDITIONAL DRAWING REFERENCES

D1 DOMESTIC RISER DIAGRAM — 1/4"=1'-0"
- P2.2 / P5.2 — DOMESTIC RISER DIAGRAM IDENTIFIER
- P2.3 — DRAWING WHERE DOMESTIC RISER IS INDICATED
- P2.4 — DRAWING WHERE DOMESTIC RISER IS TAGGED
- ADDITIONAL DRAWING REFERENCES

G1 FUEL GAS RISER DIAGRAM — 1/4"=1'-0"
- P2.2 / P5.2 — FUEL GAS RISER DIAGRAM IDENTIFIER
- P2.3 — DRAWING WHERE FUEL GAS RISER IS INDICATED
- P2.4 — DRAWING WHERE FUEL GAS RISER IS TAGGED
- ADDITIONAL DRAWING REFERENCES

N — PLAN NORTH

TRUE NORTH ARROW

GENERAL DATA

PLUMBING GENERAL DATA

Item	Value
SERVICE SIZING	
INSTANTANEOUS DEMAND (GPM)	68
SUPPLY FIXTURE UNITS (SFU)	95
DRAINAGE FIXTURE UNITS (DFU)	67
STORM DRAINAGE	
AREA OF ROOF (SQUARE FEET)	12047
AREA OF WALL ABOVE/ADJACENT TO ROOF (SQUARE FEET)	NA
TOTAL ROOF DRAINAGE (SQUARE FEET)	12047
WATER HEATERS	
NUMBER	1
HOT WATER REQUIRED	85GPH
FUEL USED	NATURAL GAS

GENERAL NOTES

A. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.

B. COORDINATE PIPING LOCATIONS AND INSTALLATION WITH EACH TRADE TO AVOID CONFLICTS WITH OTHER TRADES.

C. PROVIDE FLOOR CLEANOUTS INDICATED FLUSH WITH FLOOR FINISHES.

D. PROVIDE CLEANOUTS WHERE INDICATED AND ADDITIONAL CLEANOUTS AS REQUIRED BY LOCAL CODE.

E. REFER TO DRAWINGS FROM EACH DISCIPLINE BEFORE ROUGHING-IN PLUMBING FIXTURES.

F. OBTAIN DIMENSIONS AND ROUTING IN FIELD BEFORE INSTALLATION OF PLUMBING AND FIXTURES.

G. INSTALL ALL DRAINAGE PATTERN FITTINGS AND PIPING IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL CODES.

H. REFER TO STRUCTURAL DRAWINGS FOR DETAILS AND MAXIMUM SPACING REQUIREMENTS REGARDING HANGER ATTACHMENTS TO STEEL BAR JOISTS.

I. PROVIDE ISOLATION VALVES IN ACCORDANCE WITH DIAGRAMS, DETAILS, AND DIVISION 22 SPECIFICATIONS.

Moseley
320D NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
DAVID T. WHATELY
Lic. No. 052209
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS

DATE	DESCRIPTION

LEGENDS, ABBREVIATIONS AND GENERAL NOTES

P0.1.1

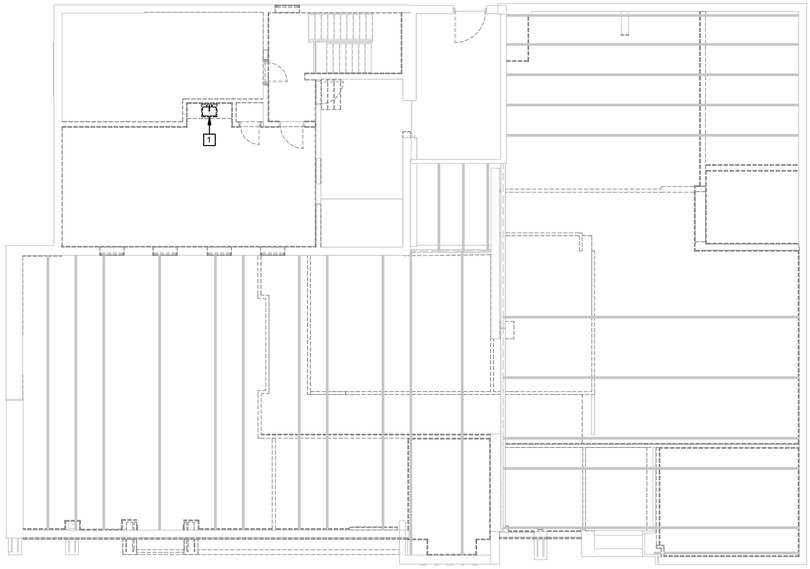
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KEYNOTES

APPLIES TO THIS DRAWING

1 REMOVE EXISTING PLUMBING FIXTURES AND ALL ASSOCIATED PIPING, FITTINGS, AND ACCESSORIES COMPLETE BACK TO MAIN WATER SERVICE AND CAP AT MAIN SERVICE VALVE. UNDERGROUND SANITARY PIPING CAN BE CAPPED FLUSH AT FLOOR AND ABANDON IN PLACE. REFER TO DECOMMISSIONING DETAIL ON SHEET P5.2.

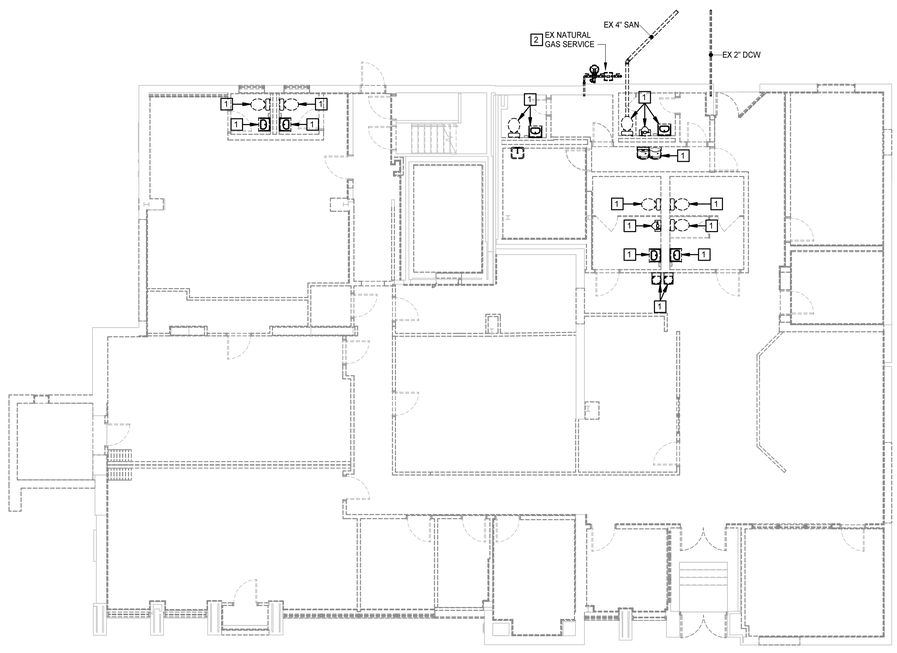
2 REMOVE EXISTING GAS SERVICE AND ALL ACCESSORIES BACK VALVE AT MAIN AND PREPARE SERVICE FOR INSTALLATION OF NEW METER AND REGUALTOR IN NEW LOCATION. REFER TO FLOOR PLANS FOR NEW LOCATION.



N

SECOND FLOOR - DEMOLITION

1/8" = 1'-0"



N

FIRST FLOOR PLAN - DEMOLITION

1/8" = 1'-0"

Moseley
320D NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
DAVID T. WHATELY
Lic. No. 052209
10/21/26
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DIGITAL SIGNATURE LOCATION:

0' 2' 4' 8' 16'
1/8"=1'-0"

N

SOUTH HILL NEW POLICE STATION

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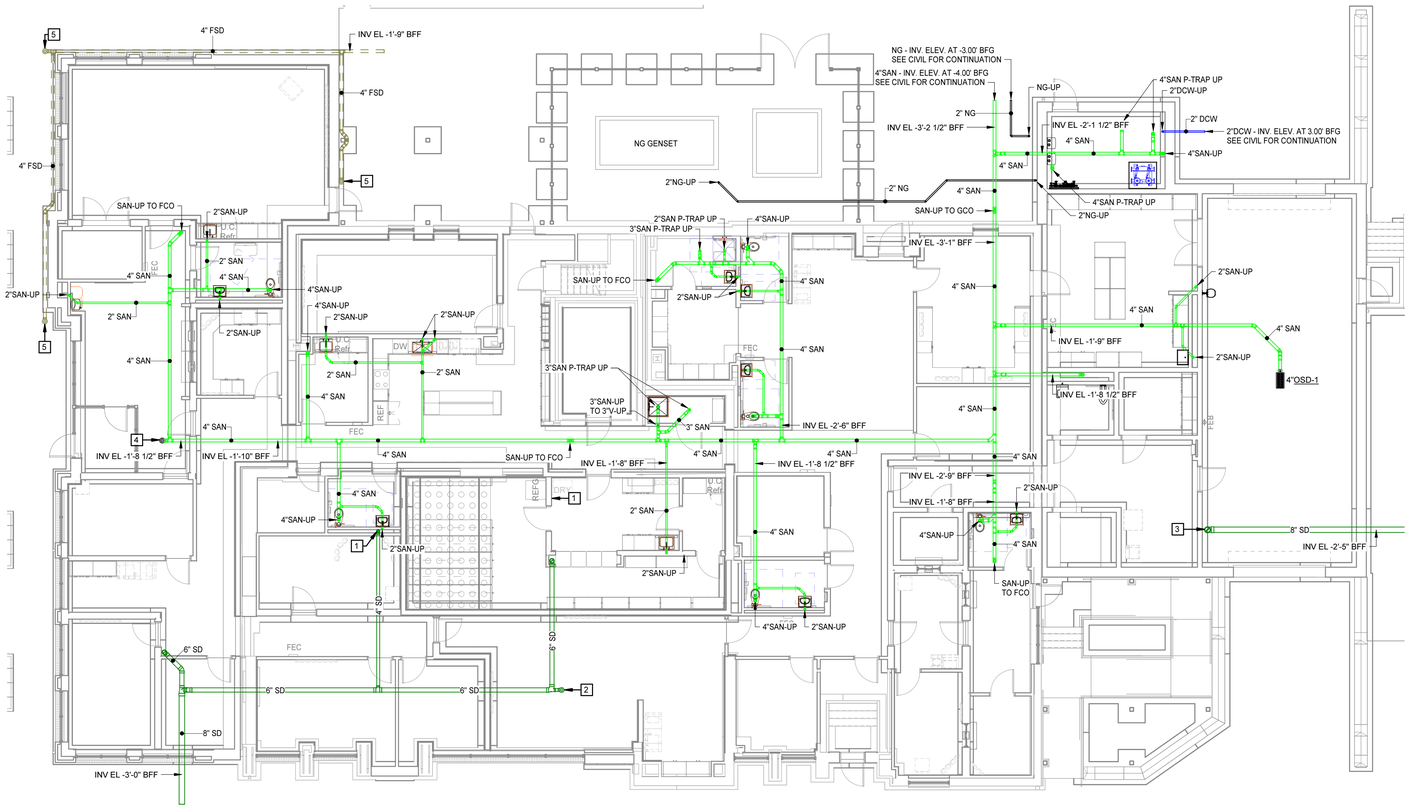
DEMOLITION FLOOR PLAN

P0.3.1

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KEYNOTES
APPLIES TO THIS DRAWING

1	6" SD UP
2	4" SD UP TO FCO.
3	8" SD UP
4	4" SAN UP TO FCO.
5	4" FSD UP TO GCO



N

FOUNDATION PLAN - PLUMBING
1/8" = 1'-0"

Moseley
3200 NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

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DIGITAL SIGNATURE LOCATION:

0' 2' 4' 8' 16'
1/8"=1'-0"

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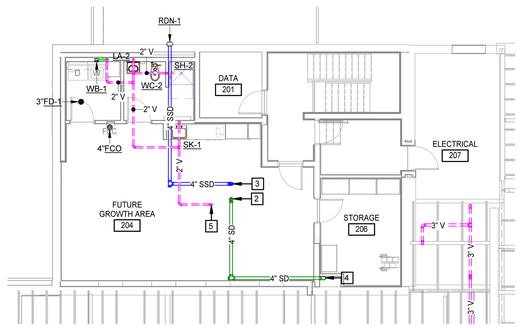
FOUNDATION PLAN - PLUMBING

P1.0.1

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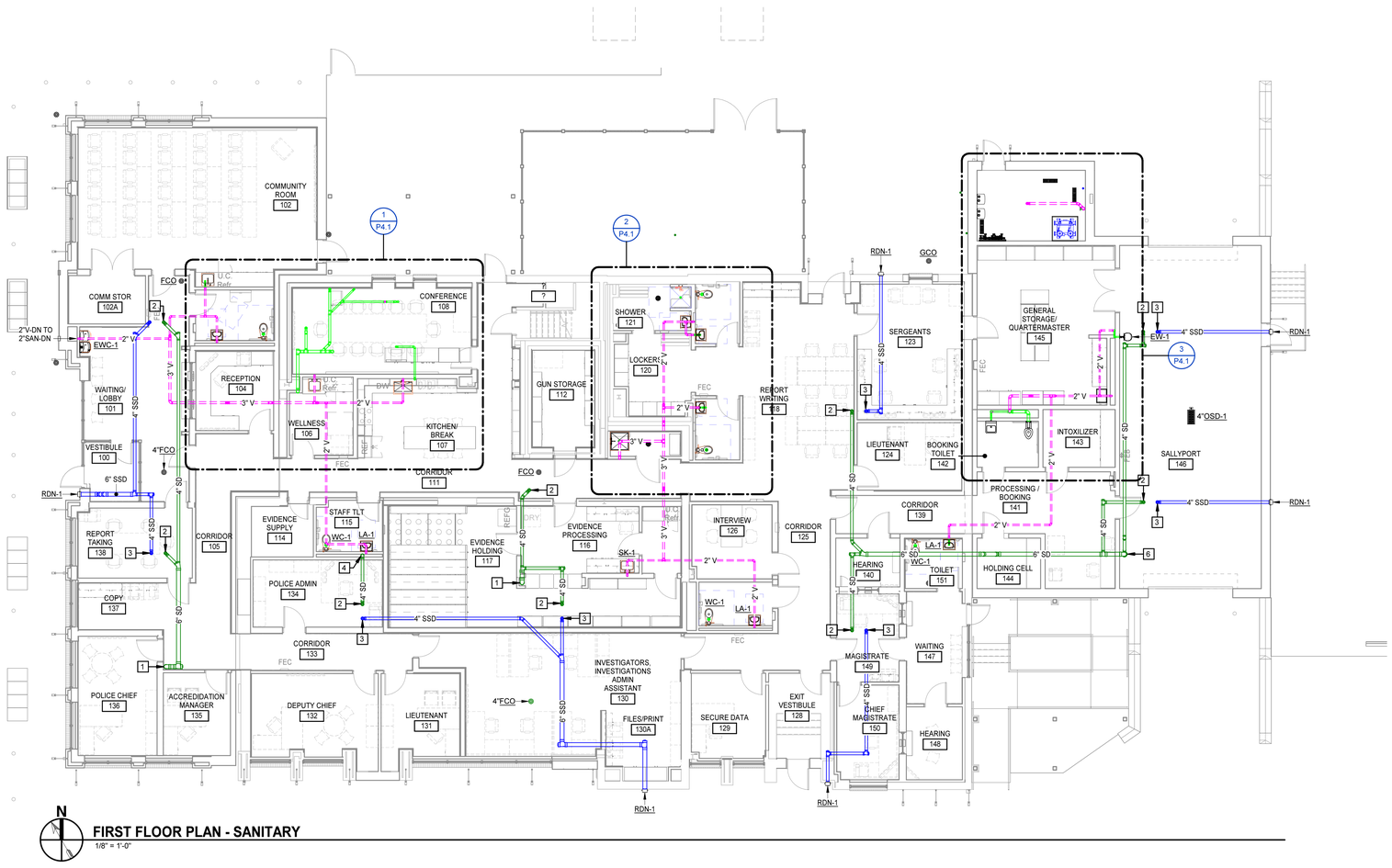
KEYNOTES
APPLIES TO THIS DRAWING

1	6" SD DN
2	4" SD UP
3	4" SSD UP
4	4" SD DN
5	2" VTR
6	8" SD DN



N

SECOND FLOOR PLAN - SANITARY
1/8" = 1'-0"



N

FIRST FLOOR PLAN - SANITARY
1/8" = 1'-0"

Moseley
3200 NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
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DIGITAL SIGNATURE LOCATION:

0' 2' 4' 8' 16'
1/8"=1'-0"

N

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TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

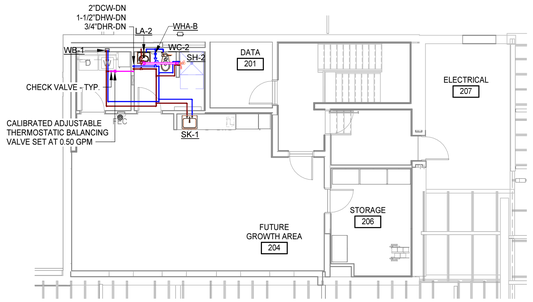
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DATE	DESCRIPTION

FLOOR PLANS - SANITARY

P1.1.1

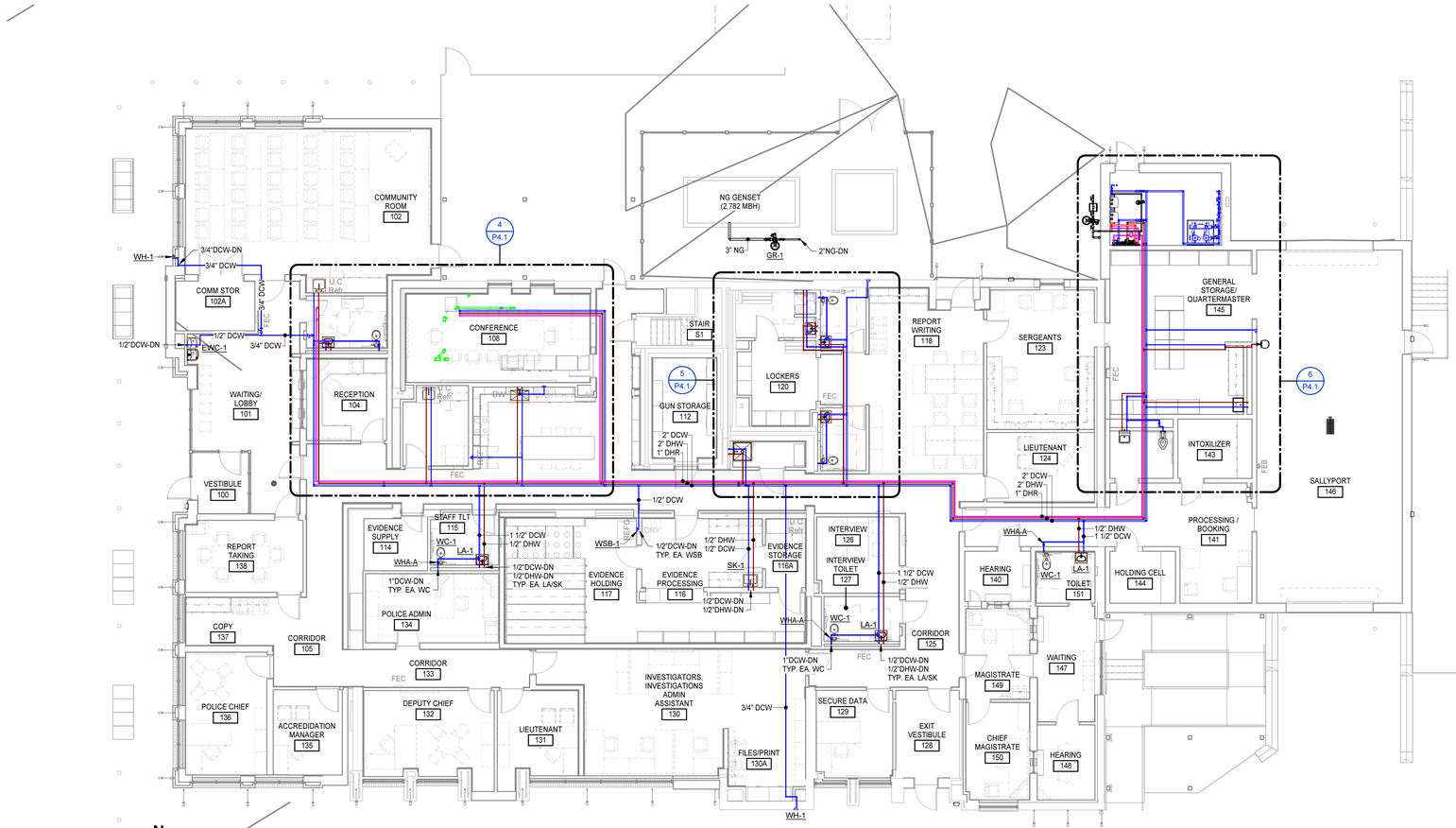
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N

SECOND FLOOR PLAN - DOMESTIC

1/8" = 1'-0"



N

FIRST FLOOR PLAN - DOMESTIC

1/8" = 1'-0"

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320D NORFOLK STREET
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10/21/26
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DIGITAL SIGNATURE LOCATION:

0' 2' 4' 8' 16'
1/8"=1'-0"

N

SOUTH HILL NEW POLICE STATION

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111 E. DANVILLE STREET, SOUTH HILL, VA 23970

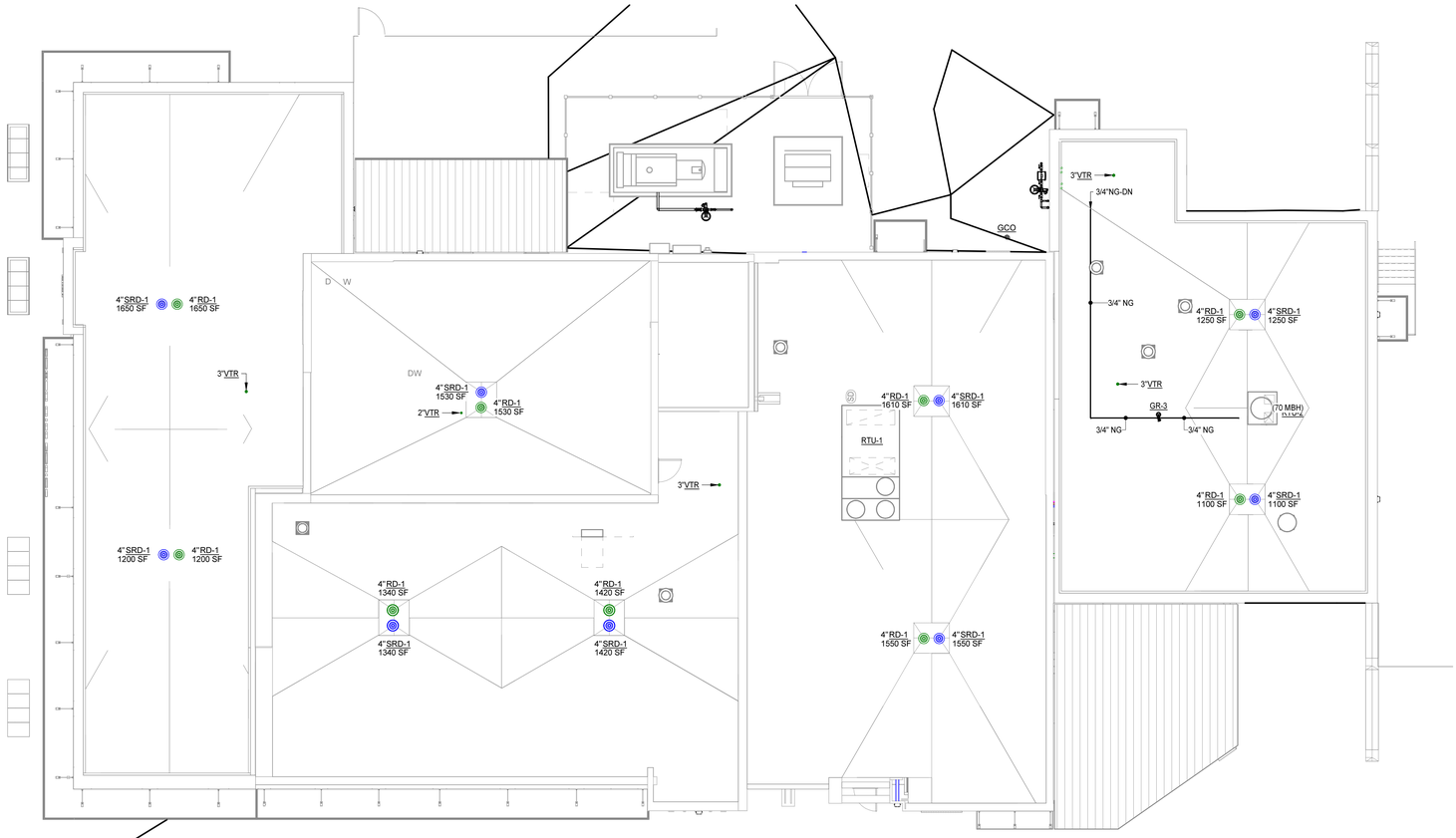
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

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DATE DESCRIPTION

FLOOR PLANS - DOMESTIC

P1.1.2

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N

ROOF PLAN - PLUMBING

1/8" = 1'-0"

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Lic. No. 052209
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

0' 2' 4' 8' 16'
1/8"=1'-0"

N

SOUTH HILL NEW POLICE STATION

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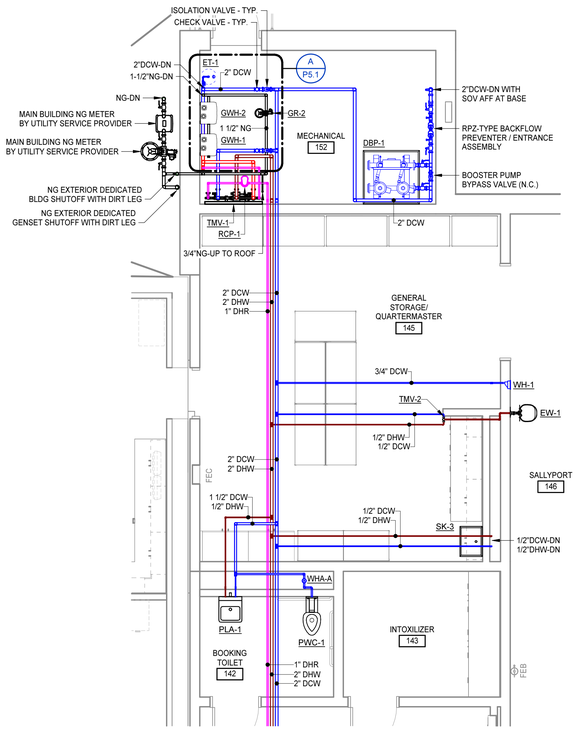
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

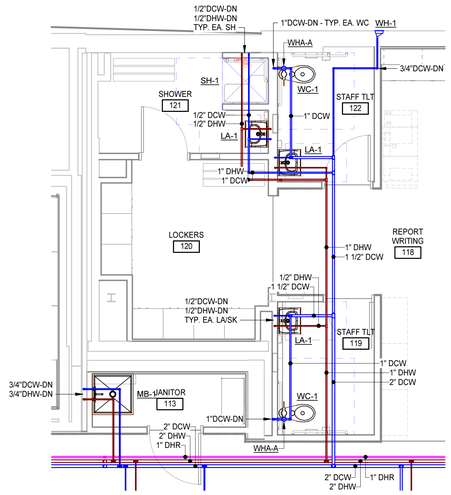
ROOF PLAN - PLUMBING

P1.1.3

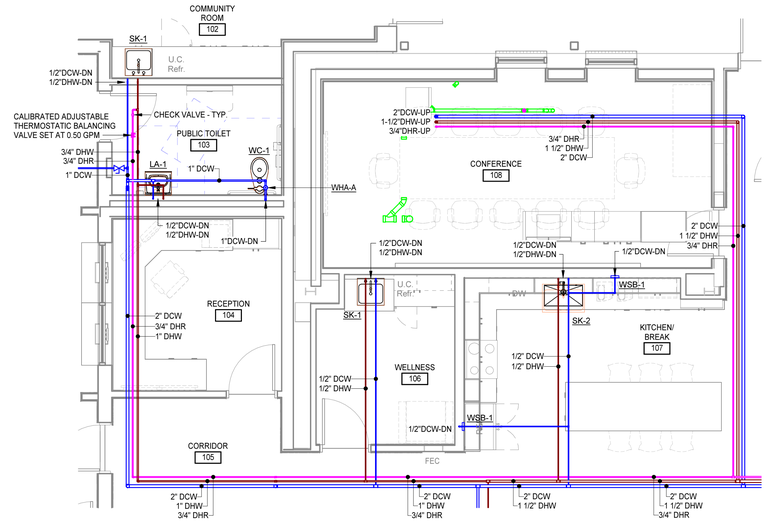
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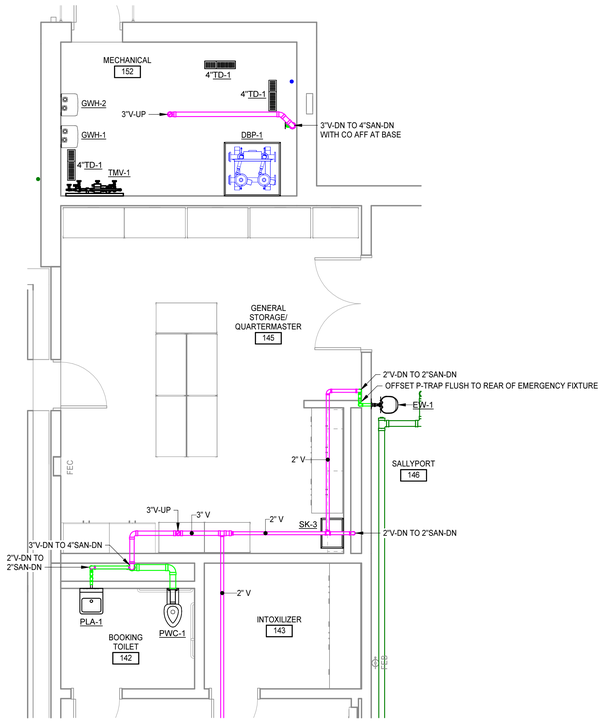
6 P1.1.2 P4.1 **ENLARGED FIRST FLOOR PLAN - DOMESTIC - MECHANICAL ROOM**
1/4" = 1'-0"



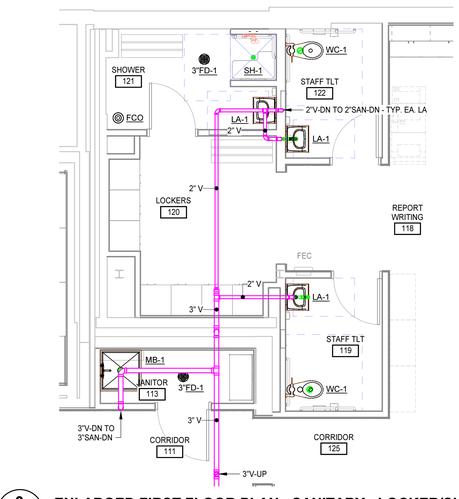
5 P1.1.2 P4.1 **ENLARGED FIRST FLOOR PLAN - DOMESTIC - LOCKER/SHOWER**
1/4" = 1'-0"



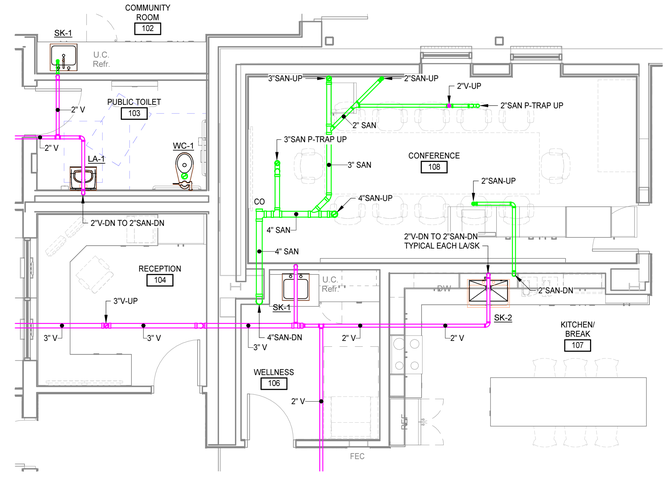
4 P1.1.2 P4.1 **ENLARGED FIRST FLOOR PLAN - DOMESTIC - KITCHEN/BREAK**
1/4" = 1'-0"



3 P1.1.1 P4.1 **ENLARGED FIRST FLOOR PLAN - SANITARY - MECHANICAL ROOM**
1/4" = 1'-0"



2 P1.1.1 P4.1 **ENLARGED FIRST FLOOR PLAN - SANITARY - LOCKER/SHOWER**
1/4" = 1'-0"



1 P1.1.1 P4.1 **ENLARGED FIRST FLOOR PLAN - SANITARY - KITCHEN/BREAK**
1/4" = 1'-0"

Moseley
3200 NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
DAVID T. WHATELY
Lic. No. 052209
10/21/25
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

0' 1' 2' 4' 8'
1/4"=1'-0"

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

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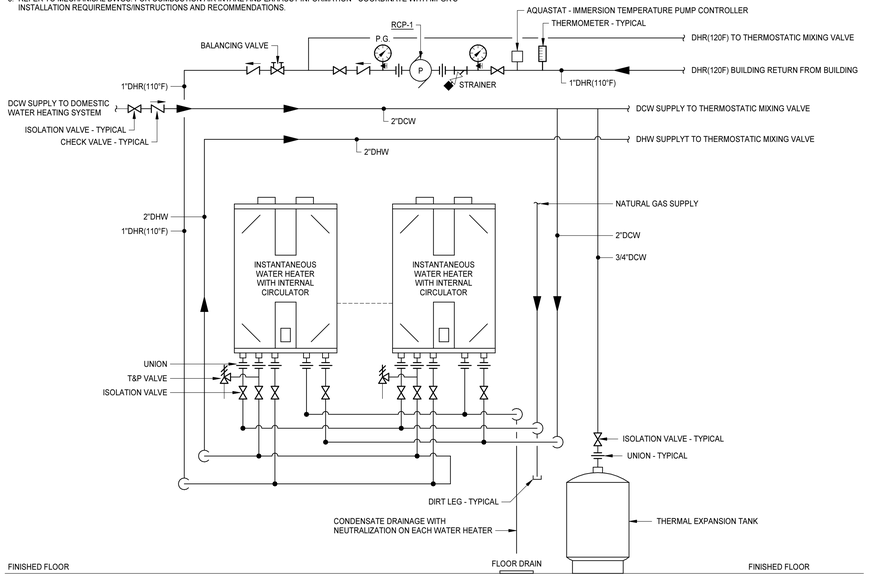
REVISIONS	
DATE	DESCRIPTION

ENLARGED FLOOR PLANS

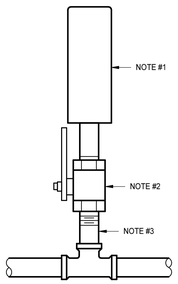
P4.1

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NOTES:
1. REFER TO GAS CONNECTION AND GAS PIPE CONNECTION DETAILS AND MANUFACTURER'S (MFGR'S) RECOMMENDATIONS FOR FINAL GAS EQUIPMENT CONNECTIONS, PRESSURE REQUIREMENTS, AND FLOW REQUIREMENTS.
2. WHERE WATER HEATERS ARE MANIFOLDED TOGETHER IN PARALLEL, REFER TO MFGR'S RECOMMENDED INSTALLATION PIPING ARRANGEMENTS AND PROVIDE PERCISION CUT EQUAL LEG PIPING, REVERSE RETURN MANIFOLD, OR MFGR'S MANIFOLD PIPING FOR INLETS AND OUTLETS FOR BALANCING FLOW AND PRESSURE TO AND FROM EACH HEATER.
3. REFER TO MECHANICAL DWGS. FOR COMBUSTION AIR INTAKE AND EXHAUST INFORMATION - COORDINATE WITH MFGR'S INSTALLATION REQUIREMENTS/INSTRUCTIONS AND RECOMMENDATIONS.

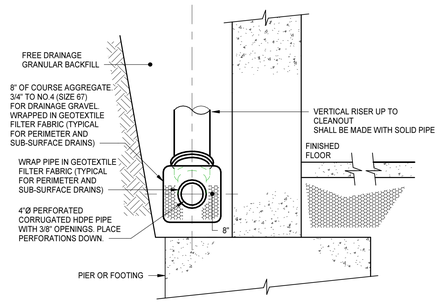


A INSTANTANEOUS GAS WATER HEATER DETAIL
P4.1 P5.1
12" = 1'-0"

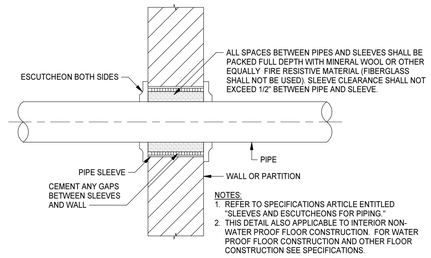


NOTES:
1. WATER HAMMER ARRESTOR.
2. BALL VALVE. VALVE SIZE SHALL BE EQUAL TO NOMINAL SIZE OF ARRESTOR OUTLET (MINIMUM 1/2").
3. BRANCH PIPE EQUAL TO NOMINAL SIZE OF ARRESTOR OUTLET (MINIMUM 1/2").

WATER HAMMER ARRESTOR DETAIL
NO SCALE

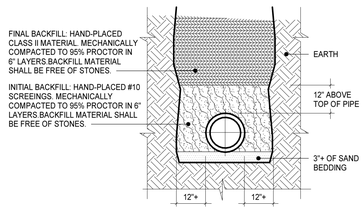


PERIMETER AND SUB-SURFACE DRAIN WITH WALL CLEANOUT DETAIL
NO SCALE

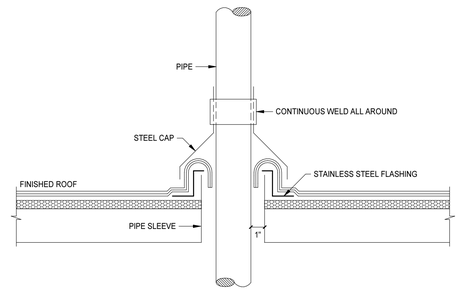


NOTES:
1. REFER TO SPECIFICATIONS ARTICLE ENTITLED "SLEEVES AND ESCUTCHEONS FOR PIPING."
2. THIS DETAIL ALSO APPLICABLE TO INTERIOR NON-WATER PROOF FLOOR CONSTRUCTION. FOR WATER PROOF FLOOR CONSTRUCTION AND OTHER FLOOR CONSTRUCTION SEE SPECIFICATIONS.

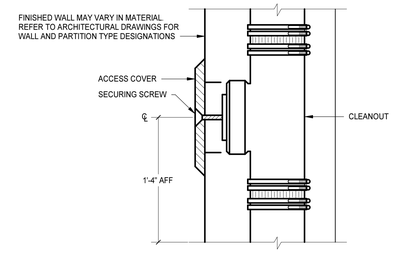
PIPE THRU FIRE RATED PARTITION & WALL DETAIL
NO SCALE



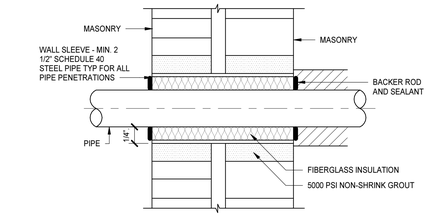
CAST IRON PIPE BEDDING DETAIL
NO SCALE



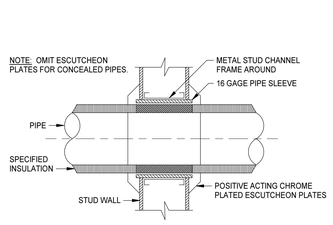
UNINSULATED PIPE THRU ROOF DETAIL
NO SCALE



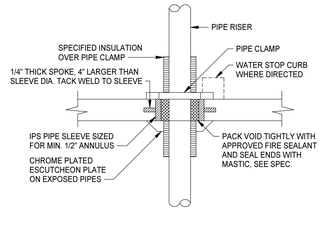
WALL CLEANOUT DETAIL
NO SCALE



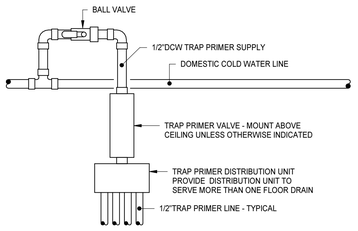
PIPE SLEEVE DETAIL
NO SCALE



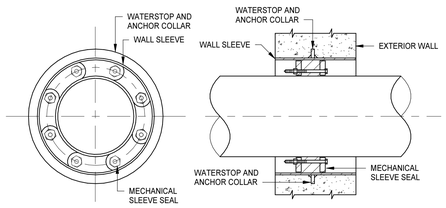
PIPE THRU STUD WALL DETAIL
NO SCALE



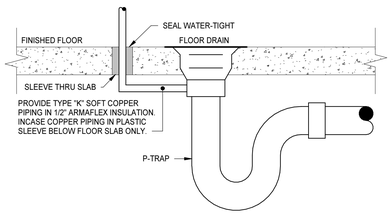
PIPE THRU FLOOR SLAB DETAIL
NO SCALE



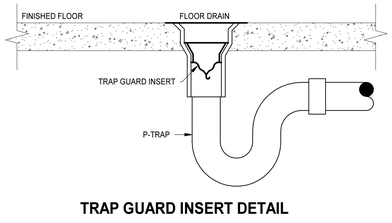
NOTES:
1. PRIMERS, VALVES, AND ASSOCIATED PIPING SHALL BE INSTALLED IN ACCESSIBLE LOCATIONS.
2. PROVIDE DISTRIBUTION UNIT SIZED FOR NUMBER OF DRAINS TO BE SERVED BY EACH INDIVIDUAL PRIMER.
3. DISTRIBUTION UNIT SHALL BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.



MECHANICAL SLEEVE SEAL DETAIL
NO SCALE

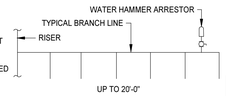


MECHANICAL PRIMER DETAIL



TRAP GUARD INSERT DETAIL

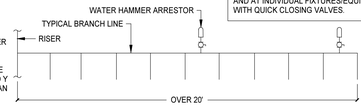
BRANCH LINES OF 20 FEET OR LESS:
PLACE WATER HAMMER ARRESTOR AT THE END OF THE BRANCH LINE BETWEEN THE LAST TWO FIXTURES SERVED, AS SHOWN. SELECT REQUIRED MODEL USING FIXTURE UNIT SIZING.



TYPICAL NOTE:
SHUTOFF ISOLATION VALVE. INSTALL 12"x12" ACCESS PANEL AT EACH LOCATION.

WATER HAMMER ARRESTORS SHALL BE PROVIDED AT ALL FIXTURE GROUPS WHERE FIXTURES HAVE QUICK CLOSING VALVES, AND AT INDIVIDUAL FIXTURES/EQUIPMENT WITH QUICK CLOSING VALVES.

BRANCH LINES EXCEEDING 20 FEET:
PLACE AN ADDITIONAL WATER HAMMER ARRESTOR AS SHOWN AT RIGHT. SELECT REQUIRED MODELS USING FIXTURE UNIT SIZING. THE SUM OF THE FIXTURE UNIT RATING OF UNITS X AND Y SHALL BE EQUAL TO OR GREATER THAN THE DEMAND OF THE BRANCHES.

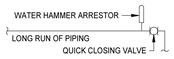


P.D.I. WATER HAMMER ARRESTORS

LENGTH OF PIPE	NOMINAL PIPE DIAMETERS					
	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
25'	A	A	B	C	D	E
50'	A	B	C	D	E	F
75'	B	C	D	AE	F	EF
100'	C	D	E	F	CF	FF
125'	C	D	F	AF	EF	EFF
150'	D	E	F	DF	FF	FFF

WHEN LONG RUNS OF PIPING ARE EMPLOYED TO SERVE REMOTE EQUIPMENT, WATER HAMMER ARRESTOR SHOULD BE LOCATED AS CLOSE AS POSSIBLE TO THE POINT OF QUICK CLOSURE OR HAMMER SOURCE.

THE SIZE AND QUANTITY OF WATER HAMMER ARRESTORS TO BE INSTALLED IN BRANCH LINES IS SHOWN IN TABLE. WHEN FLOW PRESSURE OF 65 PSIG TO 85 PSIG ARE USED, THE NEXT LARGER SIZE SHOULD BE SELECTED.



WATER HAMMER ARRESTOR CAPACITIES

CONN. SIZE	PDI SIZE	FIXTURE UNIT CAPACITY	CUBIC INCH VOLUME
1/2"	A	1 TO 11	5
3/4"	B	12 TO 32	7
1"	C	33 TO 60	11
1"	D	61 TO 113	20
1"	E	114 TO 154	29
1"	F	155 TO 330	34

NOTE: MATCH TOTAL FIXTURE UNITS OF BRANCH LINE TO CORRECT SIZE OF WATER HAMMER ARRESTOR.

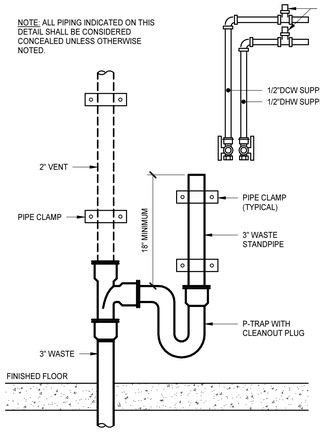
SHOCK ABSORBER SELECTION

CODE	PDI SIZE	FIXTURE UNITS
SA-1	A	1-11
SA-2	B	12-32
SA-3	C	33-60
SA-4	D	61-113
SA-5	E	114-154
SA-6	F	155-330

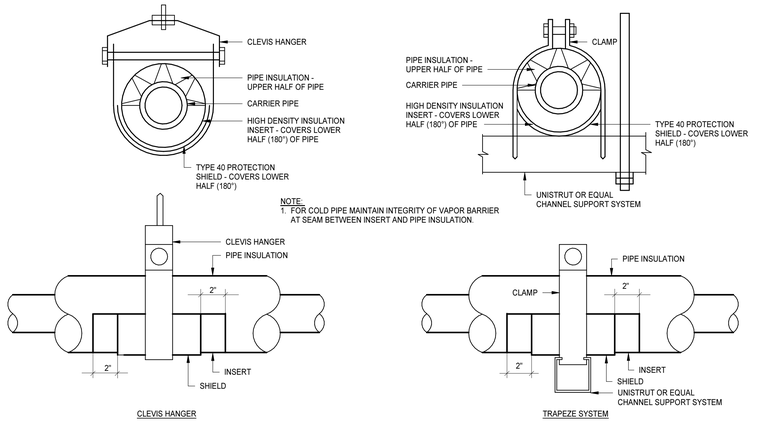
SHOCK ABSORBER SELECTION TABLE

WATER HAMMER ARRESTOR INSTALLATION & SIZING DETAIL
NO SCALE

NOTE: ALL PIPING INDICATED ON THIS DETAIL SHALL BE CONSIDERED CONCEALED UNLESS OTHERWISE NOTED.



WASHING MACHINE STANDPIPE DRAIN DETAIL
NO SCALE



PIPE SUPPORT AND THERMAL SHIELD DETAILS
NO SCALE

TRAP PRIMER ASSEMBLY DETAILS
NO SCALE

Moseley
320D NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
DAVID T. WHATELY
Lic. No. 052209
10/21/25
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

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DATE DESCRIPTION

DETAILS

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PUMP SCHEDULE

TAG	BASIS OF DESIGN		LOCATION	SYSTEM TYPE	PUMP TYPE	OPERATING DATA					ELECTRICAL DATA			CONNECTION SIZE		NOTES
	MANUFACTURER	MODEL				FLOW (GPM)	PRESSURE (FT)	EFFICIENCY	POWER (HP)	SPEED (RPM)	VOLTS	PHASE	HERTZ	INLET (IN)	OUTLET (IN)	
DBP-1	GRUNDFOS	HYDRO MULTI-E 2 CME 10-3 UK A-A-A-U-D	MECHANICAL 155	DCW	BOOSTER	70	67	48.9	6.6	3358	208	3	60	2"	2"	2
RCP-1	GRUNDFOS	MAGNA3 25-40	MECHANICAL 155	DHW	RECIRCULATION	5	23	78.3	0.045	2594	115	1	60	1"	1"	1

1. PROVIDE ECM-CONTROLLED RECIRCULATION PUMP WITH INTEGRAL TEMPERATURE AND PRESSURE SENSORS AND LOGIC. UNIT SHALL BE FULLY ADJUSTABLE FOR VARYING FIELD CONDITIONS.
2. PROVIDE FULLY-PACKAGED, NSF-61 COMPLIANT, VFD OR ECM CONTROLLED, DOMESTIC WATER BOOSTER PUMP SKID WITH EACH PUMP SIZED FOR 50% OF THE TOTAL LOAD. OUTLET PRESSURE SHALL BE SET TO MAINTAIN 70PSIG.

GAS WATER HEATER SCHEDULE

TAG	BASIS OF DESIGN		LOCATION	CAPACITY (GALLONS)	RECOVERY RATE (GPH)	TEMPERATURE RISE (°F)	TEMPERATURE SETTING (°F)	FUEL DATA			ELECTRICAL DATA			NOTES
	MANUFACTURER	MODEL						TYPE	INPUT RATE (BTUH)	MAX. INLET PRESSURE (INCHES W.C.)	VOLTAGE	PHASE	HERTZ	
GWH-1	NAVIEN	NPE-240A2	MECHANICAL 155	1.2	5.6	90	140	NATURAL GAS	199900	14	120	1	60	
GWH-2	NAVIEN	NPE-240A2	MECHANICAL 155	1.2	5.6	90	140	NATURAL GAS	199900	14	120	1	60	

1. PROVIDE PARALLEL INSTALLATIONS WITH PRECISION CUT EQUAL LEG PIPING, REVERSE-RETURN MANIFOLD PIPING, OR MANUFACTURER'S MANIFOLD INSTALLATION KIT. REFER TO MANUFACTURER'S INSTALLATION REQUIREMENTS AND RECOMMENDATIONS.

THERMOSTATIC MIXING VALVE SCHEDULE

TAG	BASIS OF DESIGN		DESIGN FLOW (GPM)	FLOW RANGE (GPM)	MAX. P.D. AT DESIGN FLOW (PSI)	HW SYSTEM TEMPERATURES		CONNECTION SIZE		NOTES
	MANUFACTURER	MODEL				INLET (°F)	OUTLET (°F)	INLET (IN)	OUTLET (IN)	
TMV-1	ARMSTRONG	DMC40	48	48-98	5	140	120	1 1/2"	1 1/2"	
TMV-2	BRADLEY	S19-2000-EFX8-RB00	4	0.5-5.00	5	120	85	3/4"	3/4"	1

1. PROVIDE ASSE-1071 EMERGENCY THERMOSTATIC MIXING VALVE LOCATED HIGH ABOVE CEILING DIRECTLY AT EMERGENCY FIXTURE SERVED.

PLUMBING FIXTURE SCHEDULE

TAG	FIXTURE	HEIGHT A.F.F.	PIPE SIZE					NOTES
			COLD WATER	TEPID WATER	HOT WATER	VENT	SOIL WASTE	
EW-1	WALL-MOUNT EYE/FACE WASH	SPRAYHEADS AT 36"		3/4"		1 1/4"	1 1/4"	1, 4
EWC-1	BI-LEVEL WATER COOLER (ACCESSIBLE)	TOP OF BUBBLER AT 39", LOWER AT 34"	1/2"	0"	0"	1 1/2"	1 1/2"	1
LA-1	WALL-HUNG LAVATORY (ACCESSIBLE) WITH MANUALLY-OPERATED FAUCET	RIM AT 34"	1/2"	0"	1/2"	1 1/2"	1 1/2"	1, 3
LA-2	WALL-HUNG LAVATORY WITH MANUALLY-OPERATED FAUCET	RIM AT 34"	1/2"	0"	1/2"	1 1/2"	1 1/2"	
MB-1	MOP BASIN (32" x 32")	RIM AT 12"	3/4"		3/4"	2"	3"	
PLA-1	WALL-HUNG LAVATORY (ACCESSIBLE)	RIM AT 34"	1/2"	0"	1/2"	1 1/2"	1 1/2"	1
PWC-1	FLOOR MOUNTED WATER CLOSET (ACCESSIBLE)	TOP OF SEAT 17"	1 1/2"	0"	0"	3"	3"	1
SH-1	INDIVIDUAL SHOWER (ACCESSIBLE)	CONTROLS AT 42", SHOWERHEAD AT 72"	1/2"	0"	1/2"	2"	2"	1
SH-2	INDIVIDUAL SHOWER	CONTROLS AT 42", SHOWERHEAD AT 78"	1/2"	0"	1/2"	2"	2"	
SK-1	SINK - SINGLE BASIN	COUNTER MOUNTED REFER TO ARCH DWGS	1/2"	0"	1/2"	1 1/2"	1 1/2"	
SK-2	SINK - SINGLE BASIN	COUNTER MOUNTED REFER TO ARCH DWGS	1/2"	0"	1/2"	1 1/2"	1 1/2"	5
SK-3	UTILITY SINK	RIM AT 30"	1/2"	0"	1/2"	1 1/2"	1 1/2"	
WB-1	WALL BOX - WASHER	CENTER AT 42"	1/2"	0"	1/2"	2"	2"	
WC-1	FLOOR MOUNTED WATER CLOSET (ACCESSIBLE)	TOP OF SEAT 17"	1"	0"	0"	2"	4"	1, 2
WC-2	FLOOR MOUNTED WATER CLOSET	TOP OF SEAT 15"	1"	0"	0"	2"	4"	2
WH-1	WALL HYDRANT	CENTERLINE OF OUTLET AT 18"	3/4"					
WSB-1	ICE MAKER OUTLET BOX	BOTTOM AT 8"	1/2"					

1. THIS ACCESSIBLE FIXTURE, ACCESSORIES, AND INSTALLATION SHALL CONFORM TO THE USBC AND ASAD ADA STANDARDS FOR ACCESSIBLE DESIGN.
2. LOCATE FLUSH ACTUATORS ON WIDE SIDE OF STALLS OR APPROACH AREAS.
3. PROVIDE ASSE-1070 CERTIFIED MIXING VALVE IN STAINLESS STEEL WALL CABINET, ABOVE CEILING, OR BELOW FIXTURE ACCESSIBLE BUT CONCEALED FROM VIEW.
4. PROVIDE ASSE-1071 CERTIFIED EMERGENCY MIXING VALVE ABOVE CEILING.
5. PROVIDE DISHWASHER HOOK-UP WHERE DISHWASHER IS PRESENT, CONNECT HW IN SINK BASE AND CONNECT SANITARY THRU AIR GAP FITTING OR HIGH LOOP HOSE DRAIN INTO DISHWASHER TAIL PIECE SINK DRAIN.

BACKFLOW PREVENTER SCHEDULE

TAG	BASIS OF DESIGN		LOCATION	SYSTEM	SIZE	DESIGN FLOW RATE (GPM)	PRESSURE DROP (PSI)
	MANUFACTURER	MODEL					
BFP-1	WATTS IND	LF919	FIRE SPRINKLER ROOM 136	DCW	2"	70	5

DRAIN AND CLEANOUT SCHEDULE

TAG	BASIS OF DESIGN		STRAINER/GRATE	NOTES
	MANUFACTURER	MODEL		
FCO	JOSAM	55000-1	FLOOR CLEANOUT	
FD-1	JOSAM	30000-6S-VP	6" x 6"	1
GCO	JOSAM	58680-CO	GRADE CLEANOUT	
OSD-1	JOSAM	60817	12 1/2" x 24 1/2"	
RD-1	JOSAM	21500-AE-3-22-VP	13" ROUND	
RDN-1	JOSAM	25020-Z-VP	VARIES	
SRD-1	JOSAM	21500-AE-3-16-22-VP	13" ROUND	
TD-1	JOSAM	76004-7	24" x 6"	1
WCO	JOSAM	58910	WALL CLEANOUT	

1. PROVIDE TRAP PRIMER CONNECTION AND EXTENSION, SEE DETAIL.

Moseley
320D NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
DAVID T. WHATELY
Lic. No. 052209
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

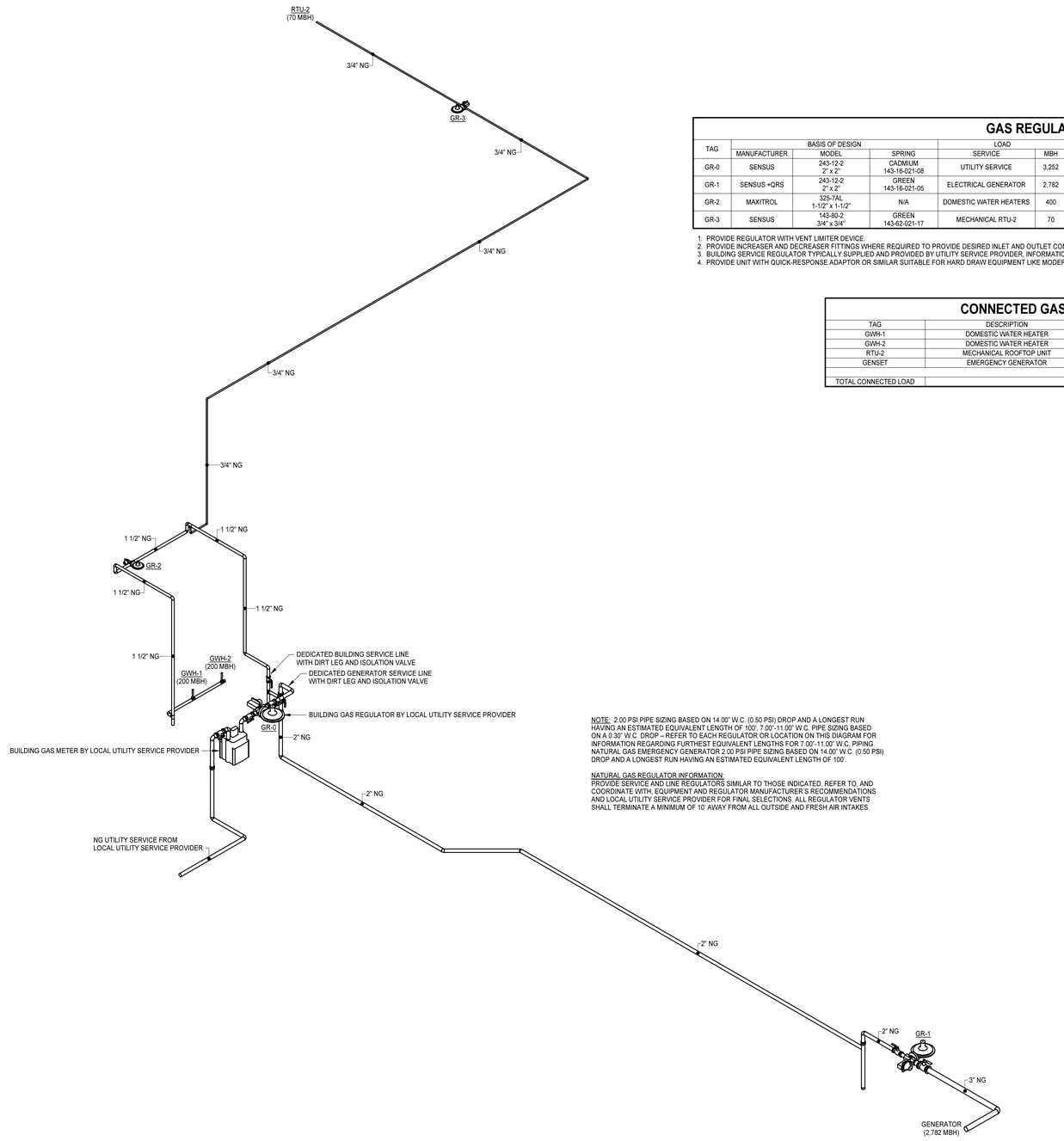
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SCHEDULES

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NOTE: 2.00 PSI PIPE SIZING BASED ON 14.00" W.C. (0.50 PSI) DROP AND A LONGEST RUN HAVING AN ESTIMATED EQUIVALENT LENGTH OF 100'. 7.00"-11.00" W.C. PIPE SIZING BASED ON A 0.30" W.C. DROP – REFER TO EACH REGULATOR OR LOCATION ON THIS DIAGRAM FOR INFORMATION REGARDING FURTHEST EQUIVALENT LENGTHS FOR 7.00"-11.00" W.C. PIPING. NATURAL GAS EMERGENCY GENERATOR 2.00 PSI PIPE SIZING BASED ON 14.00" W.C. (0.50 PSI) DROP AND A LONGEST RUN HAVING AN ESTIMATED EQUIVALENT LENGTH OF 100'.

NATURAL GAS REGULATOR INFORMATION:
PROVIDE SERVICE AND LINE REGULATORS SIMILAR TO THOSE INDICATED. REFER TO, AND COORDINATE WITH, EQUIPMENT AND REGULATOR MANUFACTURER'S RECOMMENDATIONS AND LOCAL UTILITY SERVICE PROVIDER FOR FINAL SELECTIONS. ALL REGULATOR VENTS SHALL TERMINATE A MINIMUM OF 10' AWAY FROM ALL OUTSIDE AND FRESH AIR INTAKES.

GAS PIPING DIAGRAM
NO SCALE

GAS REGULATOR SCHEDULE

TAG	BASIS OF DESIGN			LOAD		PRESSURE		ORIFICE	ORIFICE ANGLE	CONNECTION SIZE			NOTES
	MANUFACTURER	MODEL	SPRING	SERVICE	MBH	INLET (PSI)	OUTLET (PSI)			VENT (IN)	INELT (IN)	OUTLET (IN)	
GR-0	SENSUS	243-12-2 2" x 2"	CADMIUM 143-16-021-08	UTILITY SERVICE	3,252	5 PSI +	2 PSI	3/4"	10-DEG	1"	2"	2"	3
GR-1	SENSUS +QRS	243-12-2 2" x 2"	GREEN 143-16-021-05	ELECTRICAL GENERATOR	2,782	2 PSI	11" w.c.	1-1/4"	30-DEG	1"	2"	3"	2, 4
GR-2	MAXITROL	325-7AL 1-1/2" x 1-1/2"	N/A	DOMESTIC WATER HEATERS	400	2 PSI	11" w.c.	N/A	N/A	N/A	1 1/2"	1 1/2"	1, 2
GR-3	SENSUS	143-80-2 3/4" x 3/4"	GREEN 143-62-021-17	MECHANICAL RTU-2	70	2 PSI	11" w.c.	5/16"	N/A	1"	3/4"	3/4"	2

1. PROVIDE REGULATOR WITH VENT LIMITER DEVICE.
2. PROVIDE INCREASER AND DECREASER FITTINGS WHERE REQUIRED TO PROVIDE DESIRED INLET AND OUTLET CONNECTION SIZES TO VARYING REGULATOR BODY SIZES.
3. BUILDING SERVICE REGULATOR TYPICALLY SUPPLIED AND PROVIDED BY UTILITY SERVICE PROVIDER. INFORMATION INDICATED IS SHOWN FOR MINIMUM PERFORMANCE REQUIREMENT PURPOSES ONLY.
4. PROVIDE UNIT WITH QUICK-RESPONSE ADAPTOR OR SIMILAR SUITABLE FOR HARD DRAW EQUIPMENT LIKE MODERN HIGH EFFICIENCY BOILERS AND EMERGENCY GENERATORS.

CONNECTED GAS LOAD SCHEDULE

TAG	DESCRIPTION	LOCATION	INPUT (BTUH)
GWH-1	DOMESTIC WATER HEATER	MECHANICAL 152	200,000
GWH-2	DOMESTIC WATER HEATER	MECHANICAL 152	200,000
RTU-2	MECHANICAL ROOFTOP UNIT	ROOFTOP	70,000
GENSET	EMERGENCY GENERATOR	OUTDOOR MECHANICAL YARD	2,782,000
TOTAL CONNECTED LOAD			3,252,000

Moseley
320D NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

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PIPING DIAGRAMS

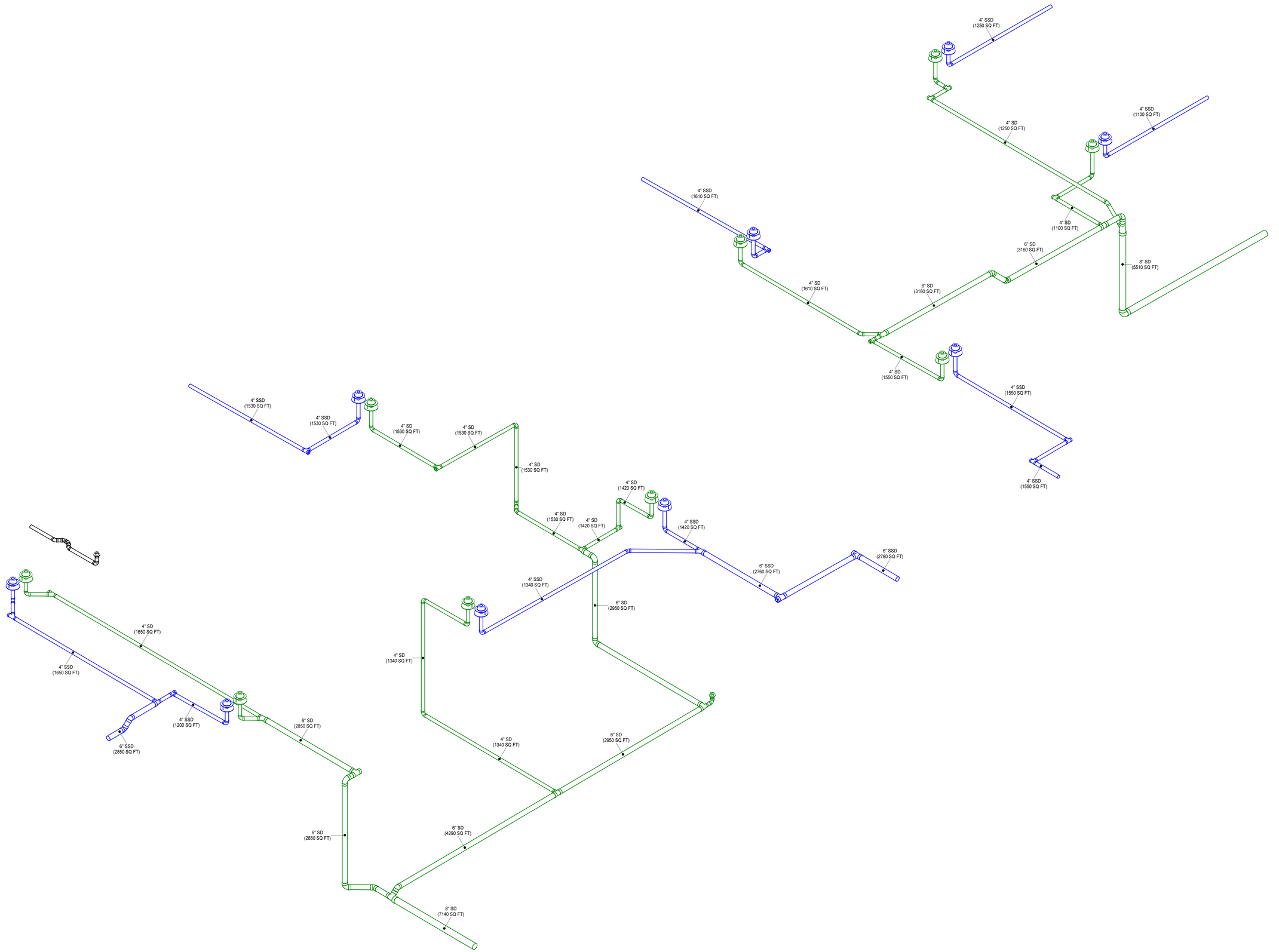
P9.1

10/30/2026 2:00:45 PM

DEB STAMP LOCATION

Moseley
3901 MICHAUX ROAD, DIRECT, SUITE 601
CHESTERFIELD, VIRGINIA 23832-2043
PHONE (804) 924-5565
MOSELEYDESIGNS.COM

CONSULTANT LOGO LOCATION



STORM DRAIN RISER DIAGRAM

NO SCALE

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

OCTOBER 21

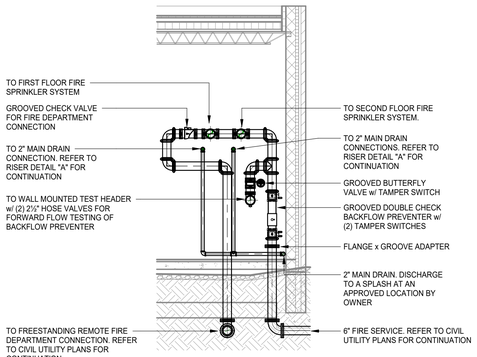
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DATE	DESCRIPTION

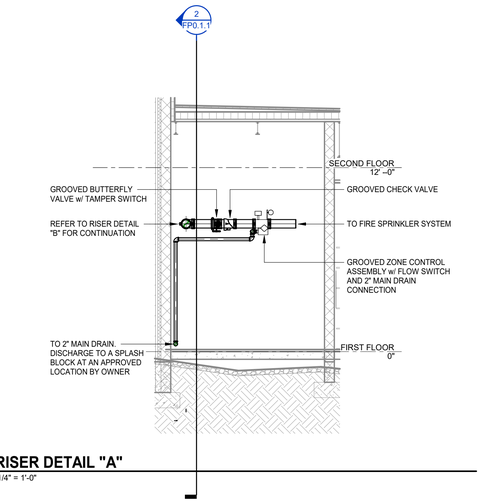
PIPING DIAGRAMS

P9.2

10/30/2026 2:00:46 PM



2 FP0.1.1 — **RISER DETAIL "B"**
FP0.1.1 FP0.1.1 1/4" = 1'-0"



1 FP1.1.1 FP0.1.1 — **RISER DETAIL "A"**
FP1.1.1 FP0.1.1 1/4" = 1'-0"

ABBREVIATIONS

@	AT
ABV	ABOVE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
BLDG	BUILDING
CL	CENTERLINE
CLG	CEILING
COL	COLUMN
CONC	CONCRETE
CONT	CONTINUATION
CORR	CORRIDOR
CR	CLASSROOM
CU	CUBIC
CU FT	CUBIC FEET
DCW	DOMESTIC COLD WATER
DEG	DEGREE(S)
DEMO	DEMOLISH OR DEMOLITION
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DN	DOWN
DP	DRY PIPE
DS	DOWNSPOUT
DTL	DETAIL
DWG	DRAWING
E	EAST
ECGH	ELECTRIC CEILING HEATER
EF	EXHAUST FAN
EH-1	EXTRA HAZARD GROUP 1
EH-2	EXTRA HAZARD GROUP 2
ELEC	ELECTRICAL
EQ	EQUAL
EQUIP	EQUIPMENT
ET	EXPANSION TANK
ETR	EXISTING TO REMAIN
EWH	ELECTRIC WATER HEATER
EX	EXISTING
EXP	EXPANSION
F	FARENHEIT
FD	FIRE DAMPER
FDC	FIRE DEPARTMENT CONNECTION
FG	FINISHED GRADE
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHS	FIRE HOSE STATION
FHVC	FIRE HOSE VALVE CABINET
FLR	FLOOR
FP	FIRE PROTECTION
FT	FOOT OR FEET
FVC	FIRE VALVE CABINET
GAL	GALLON(S)
GPM	GALLONS PER MINUTE
GUH	GAS-FIRED UNIT HEATER
HB	HOSE BIB
HD	HEAD
HORIZ	HORIZONTAL
HP	HORSEPOWER
HW	HOT WATER
ID	INSIDE DIAMETER
IN	INCH
INSUL	INSULATE OR INSULATION
JAN	JANITOR
KIT	KITCHEN
KW	KILOWATT(S)
LAB	LABORATORY
LAV	LAVATORY
LBS	POUNDS
LF	LINEAR FOOT (FEET)
LH	LIGHT HAZARD
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
N	NORTH
NA	NOT APPLICABLE/AVAILABLE
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO. OR #	NUMBER
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFF	OFFICE
OH-1	ORDINARY HAZARD GROUP 1
OH-2	ORDINARY HAZARD GROUP 2
P	PUMP
PC	PRECAST
PIV	POST INDICATOR VALVE
POLY	POLYETHYLENE
PREFAB	PREFABRICATE(D)
PROJ	PROJECT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH GAUGE
PVC	POLYVINYL CHLORIDE
R	RISER
REF	REFERENCE
REQ	REQUIRED
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RTU	ROOF TOP UNIT
S	SOUTH
SAN	SANITARY
SCH	SCHEDULE
SD	SMOKE DAMPER
SHT	SHEET
SIM	SIMILAR
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SPR	SPRINKLER
SQ	SQUARE
STD	STANDARD
STL	STEEL
STOR	STORAGE
SW	SWITCH
T	TEMPERATURE
THK	THICK(NESS)
TLT	TOILET
TOSL	TOP OF SLAB
TYP	TYPICAL
UG	UNDERGROUND
UH	UNIT HEATER
UI	UNLESS UNDICATED
UNO	UNLESS NOTED (INDICATED) OTHERWISE
V	VOLTS
VERT	VERTICAL
VIF	VERIFY IN FIELD
W	WEST
W/	WITH
W/O	WITHOUT
WH	WATER HEATER

GRAPHICS SYMBOLS LEGEND

- VALVE
- GATE VALVE
- VALVE IN RISER
- CHECK VALVE
- SOLENOID VALVE
- FLOW SWITCH
- PRESSURE REDUCING VALVE
- DOUBLE CHECK BACKFLOW PREVENTER
- F — FIRE PROTECTION WET SPRINKLER PIPING
- DP — FIRE PROTECTION DRY SPRINKLER PIPING
- FG — FIRE EXTINGUISHING GAS PIPING
- FIRE PROTECTION DRY SPRINKLER PIPING
- UNION
- PRESSURE GAUGE WITH GAUGE COCK
- PIPE TURNED DOWN
- PIPE TURNED UP
- PIPE TEE UP
- PIPE TEE DOWN
- PIPE CAP
- 1/8"/FT — PITCH PIPE DOWN IN DIRECTION OF ARROW AT INDICATED SLOPE
- FLOW IN DIRECTION OF ARROW
- CONCENTRIC PIPE REDUCTION
- ECCENTRIC PIPE REDUCTION
- PUMP
- FIRE DEPARTMENT CONNECTION
- PENDANT SPRINKLER HEAD
- CONCEALED PENDANT SPRINKLER HEAD
- UPRIGHT SPRINKLER HEAD
- HYDRAULIC NODE

- N — PLAN NORTH
- TRUE NORTH ARROW

- INDICATES AREAS OF THE BUILDING IN WHICH THE SPACING OF HEADS IS BASED ON LIGHT HAZARD CLASSIFICATION PROVIDING A DENSITY OF 0.10 GPM PER SQUARE FOOT OVER 1500 SQUARE FEET.
- INDICATES AREAS OF THE BUILDING IN WHICH THE SPACING OF HEADS IS BASED ON ORDINARY HAZARD GROUP 1 CLASSIFICATION PROVIDING A DENSITY OF 0.15 GPM PER SQUARE FOOT OVER 1500 SQUARE FEET.
- INDICATES AREAS OF THE BUILDING IN WHICH THE SPACING OF HEADS IS BASED ON ORDINARY HAZARD GROUP 2 CLASSIFICATION PROVIDING A DENSITY OF 0.20 GPM PER SQUARE FOOT OVER 1500 SQUARE FEET.
- INDICATES AREAS OF THE BUILDING IN WHICH THE SPACING OF DRY SPRINKLER HEADS IS BASED ON ORDINARY HAZARD GROUP 2 CLASSIFICATION PROVIDING A DENSITY OF 0.20GPM PER SQUARE FOOT OVER 1500 SQUARE FEET.
- INDICATES AREAS OF THE BUILDING THAT WILL REQUIRE ORDINARY HAZARD GROUP 1 PRE-ACTION PROTECTION, BRANCHING FROM THE LINE THAT SERVES THE AREA.
- INDICATES AREAS OF THE BUILDING IN WHICH THE SPACING OF HEADS IS BASED ON EXTRA HAZARD GROUP 1 CLASSIFICATION PROVIDING A DENSITY OF 0.30 GPM PER SQUARE FOOT OVER 2500 SQUARE FEET.
- INDICATES AREAS OF THE BUILDING IN WHICH THE SPACING OF HEADS IS BASED ON EXTRA HAZARD GROUP 2 CLASSIFICATION PROVIDING A DENSITY OF 0.40 GPM PER SQUARE FOOT OVER 2500 SQUARE FEET.

- POINT OF CONNECTION TO EXISTING
- LIMIT OF DEMOLITION
- 30 — KEYNOTE
- A123 — **SPACE IDENTIFICATION TAG**: SPACE NUMBER; BUILDING AREA (WHEN USED)
- AHU-02 — **EQUIPMENT IDENTIFICATION TAG**: EQUIPMENT NUMBER; UNIT DESIGNATION
- 8 — STRUCTURAL GRID LINE WITH DESIGNATION
- EX8 — EXISTING STRUCTURAL GRID LINE WITH DESIGNATION
- **SECTION WHERE CUT**: A / M6.1 — SECTION LETTER; DRAWING WHERE SECTION IS INDICATED
- **ENLARGED PLAN WHERE CUT**: 1 / M2.5 — ENLARGED PLAN NUMBER; DRAWING WHERE ENALRGED PLAN IS INDICATED
- **DETAIL TAG**: 1 / M4.1 — DETAIL NUMBER; DRAWING WHERE DETAIL IS INDICATED
- 1 / M2.2 / M4.1 / M2.3 / M2.4 — **DETAIL TITLE** 1/4"=1'-0"; DETAIL NUMBER; DRAWING WHERE DETAIL IS INDICATED; DRAWING WHERE DETAIL IS CUT; ADDITIONAL DRAWING REFERENCES
- A / M2.2 / M3.1 / M2.3 / M2.4 — **SECTION TITLE** 1/4"=1'-0"; SECTION LETTER; DRAWING WHERE SECTION IS INDICATED; DRAWING WHERE SECTION IS CUT; ADDITIONAL DRAWING REFERENCES

GENERAL NOTES

THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.

COORDINATE THE LOCATION OF ALL SPRINKLER PIPING WITH THE WORK OF OTHER TRADES. SPRINKLER PIPING SHALL NOT BE INSTALLED WHERE ITS LOCATION INHIBITS ACCESS TO EQUIPMENT ABOVE THE CEILING, FILTER ACCESS OR INFRINGES UPON CLEARANCES DICTATED BY THE NATIONAL ELECTRIC CODE.

VERIFY DIMENSIONS AND ROUTING IN FIELD BEFORE FABRICATION OF PIPING AND FIXTURES.

REFER TO THE LIFE SAFETY PLAN FOR LOCATIONS OF FIRE AND SMOKE SEPARATION ASSEMBLIES.

REFER TO STRUCTURAL DRAWINGS FOR DETAILS AND MAXIMUM SPACING REQUIREMENTS REGARDING HANGER ATTACHMENTS TO STEEL BAR JOISTS.

PROVIDE A COMPLETE WET PIPE SPRINKLER SYSTEM THROUGHOUT THE BUILDING IN ACCORDANCE WITH 2021 VIRGINIA BUILDING CODE, 2019 NFPA 13 AND ALL OTHER REQUIREMENTS SET FORTH BY LOCAL AUTHORITY HAVING JURISDICTION. INSTALLATION DRAWINGS SHALL BE PREPARED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE COMMONWEALTH OF VIRGINIA OR BY A NICET LEVEL III OR IV DESIGNER CERTIFIED IN THE FIELD OF WATER BASED SYSTEMS LAYOUT.

PIPE ALL SYSTEM DRAINS TO AN APPROVED LOCATION ON THE OUTSIDE PERIMETER OF BUILDING. DO NOT DISCHARGE DRAIN INTO A JANITORS SINK WITHOUT APPROVAL FROM PLUMBING ENGINEER.

PROVIDE SEISMIC BRACING IN ACCORDANCE w/ NFPA 13 2019 AND ASCE 7-22 REQUIREMENTS.

DESIGN FLOW DATA

THE FOLLOWING DATA SHALL BE USED FOR BID PURPOSES ONLY. CONFIRM DATA PRIOR TO CALCULATING PIPE SIZES:

LOCATION OF TEST: Main Street and S. Mecklenburg Ave.

STATIC PRESSURE: 48 psi

RESIDUAL PRESSURE: 40 psi

FLOW AT TIME OF TEST: 849 gpm

DATE OF TEST: 03/27/2026

SPRINKLER HEADS

IN SUSPENDED ACOUSTICAL OR GYPSUM BOARD CEILINGS: PROVIDE RECESSED, QUICK RESPONSE, GLASS BULB PENDENT TYPE SPRINKLERS w/ CHROME FINISH AND MATCHING ESCUTCHEON.

IN ALL SECURE AREAS: PROVIDE INSTITUTIONAL TYPE, QUICK RESPONSE SPRINKLERS w/ CHROME FINISH. TYCO MODEL RAVEN IS THE PREFERRED BRAND ALTERNATE. REFER TO ARCHITECTURAL DRAWING FOR LOCATIONS AND EXTENTS OF SECURE AREAS.

FOR HORIZONTAL SIDEWALL APPLICATIONS: PROVIDE RECESSED, QUICK RESPONSE, GLASS BULB TYPE SPRINKLERS w/ CHROME FINISH AND MATCHING ESCUTCHEON.

IN EQUIPMENT, STORAGE AND OTHER SIMILAR ROOMS WITHOUT SUSPENDED CEILINGS: PROVIDE STANDARD UPRIGHT, QUICK RESPONSE, QUICK RESPONSE w/ BRASS FINISH.

IN AREAS SUBJECT TO FREEZING TEMPERATURES SUPPLIED BY WET PIPE SPRINKLER SYSTEM; PROVIDE QUICK RESPONSE, FUSIBLE LINK TYPE DRY TYPE SPRINKLERS.

PROVIDE INTERMEDIATE TEMPERATURE SPRINKLERS WHEN INSTALLED 2'-6" OR LESS TO AN HAVC SUPPLY DIFFUSER IN CEILINGS AS REQUIRED BY NFPA 13 TABLE 8.3.2.5(a)ITEM (C) FOR HORIZONTAL DISCHARGE.

INSTALL SPRINKLERS IN CENTER OF ACOUSTICAL TILE CEILING PANELS.

Moseley
3200 NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
DAVID T. WHATELY
Lic. No. 052209
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

LEGENDS, ABBREVIATIONS AND GENERAL NOTES

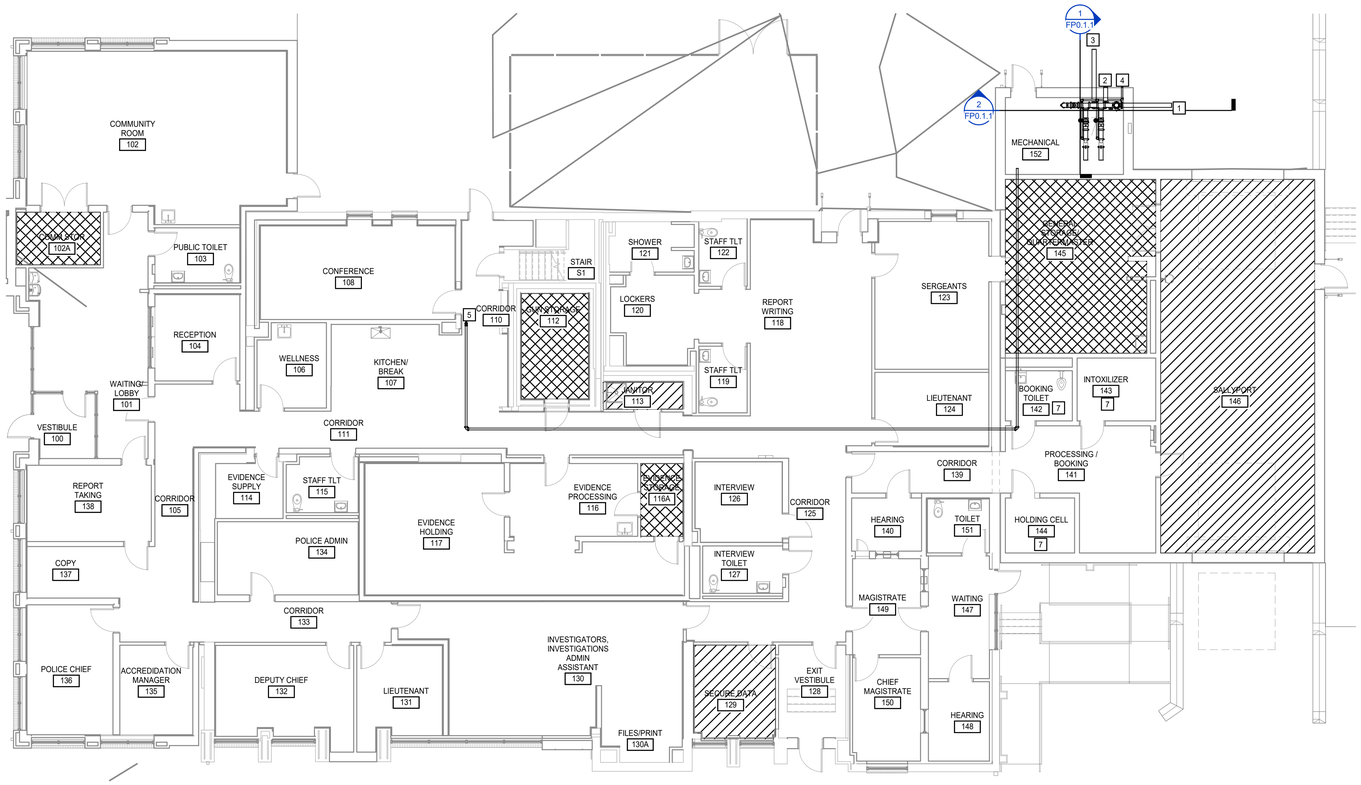
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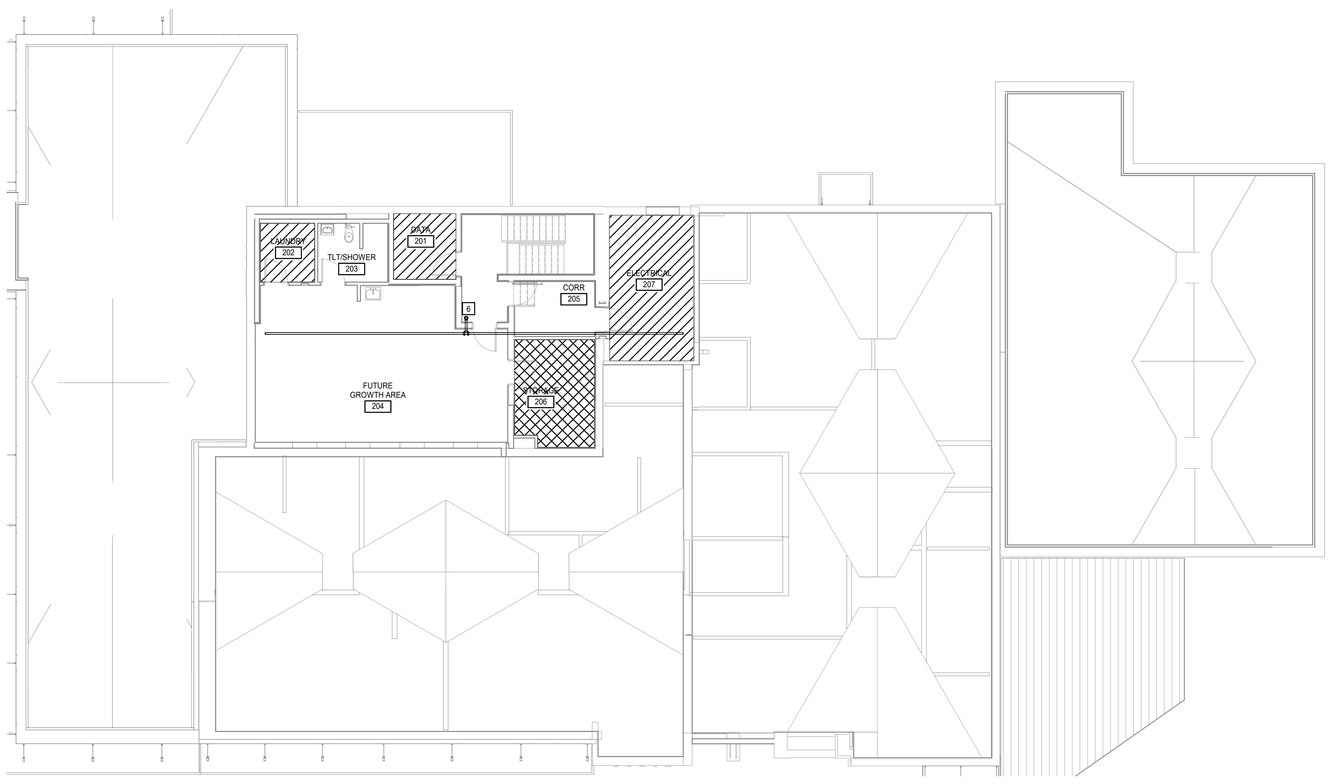
FIRE PROTECTION KEYNOTES

APPLIES TO DRAWINGS FP2.1 - FP2.nn
REPRESENTED BY [n]

1. 6" FIRE SERVICE LOCATION. REFER TO CIVIL UTILITY DRAWINGS FOR CONTINUATION.
2. LOCATION OF TEST HEADER w/ (2) 2½" HOSE VALVES FOR FORWARD FLOW TESTING OF BACKFLOW PREVENTER.
3. TO FREESTANDING FIRE DEPARTMENT CONNECTION. REFER TO CIVIL UTILITY PLANS FOR CONTINUATION.
4. LOCATION OF 2" MAIN DRAIN. INSTALL DRAIN TO DISCHARGE ON SPLASH BLOCK AT AN APPROVED LOCATION BY OWNER.
5. UP TO SECOND FLOOR FIRE SPRINKLER SYSTEM.
6. DN TO FIRST FLOOR FIRE SPRINKLER SYSTEM.
7. PROVIDE INSTITUTIONAL TYPE FIRE SPRINKLERS IN THIS AREA.



FIRST FLOOR PLAN - FIRE PROTECTION



SECOND FLOOR PLAN - FIRE PROTECTION

Moseley
3200 NORFOLK STREET
RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
DAVID T. WHATELY
Lic. No. 052209
10/21/26
PROFESSIONAL ENGINEER

DIGITAL SIGNATURE LOCATION:

0' 2' 4' 8' 16'
1/8"=1'-0"

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

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FLOOR PLANS - FIRE PROTECTION

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EQUIPMENT ABBREVIATIONS

CP	CONDENSATE PUMP
DH	DEHUMIDIFIER
EUH	ELECTRIC UNIT HEATER
F	FAN
GV	GRAVITY VENTILATOR
RTU	ROOFTOP UNIT
SSI	SPLIT-SYSTEM INDOOR UNIT
SSO	SPLIT-SYSTEM OUTDOOR UNIT
TU	TERMINAL UNIT

CONTROLS ABBREVIATIONS

AF	AIRFLOW
AI	ANALOG INPUT TO CONTROLLER
ALM	ALARM
AMS	AIRFLOW MEASURING STATION
AO	ANALOG OUTPUT FROM CONTROLLER
ATS	AVERAGING TEMPERATURE SENSOR
BAS	BUILDING AUTOMATION SYSTEM
BI	BINARY INPUT TO CONTROLLER
BO	BINARY OUTPUT FROM CONTROLLER
CO2	CARBON DIOXIDE SENSOR
CSR	CURRENT-SENSING RELAY
DM	DAMPER MOTOR
DP	DIFFERENTIAL PRESSURE
DPT	DIFFERENTIAL PRESSURE TRANSMITTER
FM	FLOW METER
FZ	FREEZESTAT
HS	HUMIDITY SENSOR
POS	POSITION
R	RELAY
SD	SMOKE DETECTOR
SPD	SPEED
SS	START/STOP
STS	STATUS
TS	TEMPERATURE SENSOR
VFD	VARIABLE-FREQUENCY DRIVE

ABBREVIATIONS

A	AMPERE(S)
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
ALT	ALTERNATE
APD	AIR PRESSURE DROP
BHP	BRAKE HORSEPOWER
BTUH	BRITISH THERMAL UNITS PER HOUR
CFM	CUBIC FEET PER MINUTE
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CLG	COOLING
COM	COMMON
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
D	DRAIN
DB	DRY BULB TEMPERATURE
dBA	A-WEIGHTED DECIBELS
DCW	DOMESTIC COLD WATER
DIA	DIAMETER
DN	DOWN
DWG	DRAWING
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EER	ENERGY EFFICIENCY RATIO
EQ	EQUAL
ESP	EXTERNAL STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE
EX	EXISTING
F	DEGREES FAHRENHEIT
FC	FAIL CLOSED
FD	FIRE DAMPER
FLA	FULL LOAD AMPS
FO	FAIL OPEN
FPM	FEET PER MINUTE
FT	FOOT, FEET
GA	GAUGE
GAL	GALLON(S)
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HP	HORSEPOWER
HPWR	HEAT PUMP WATER RETURN
HPWS	HEAT PUMP WATER SUPPLY
HTG	HEATING
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HX	HEAT EXCHANGER
HZ	HERTZ
IN	INCH
IPLV	INTEGRATED PART-LOAD VALUE
KW	KILOWATT(S)
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	ONE THOUSAND BTUH
MCA	MINIMUM CIRCUIT AMPACITY
MFR	MANUFACTURER
MIN	MINIMUM
MOCP	MAXIMUM OVERCURRENT PROTECTION
MOD	MOTOR-OPERATED DAMPER
NC	NORMALLY CLOSED (FOR PLANS, DETAILS)
NC	NOISE CRITERIA (FOR SCHEDULES)
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
OA	OUTSIDE AIR
OC	ON CENTER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PH	PHASE
PSIG	POUNDS PER SQUARE INCH GAUGE
RA	RETURN AIR
RD	REFRIGERANT DISCHARGE
RH	RELATIVE HUMIDITY
RL	REFRIGERANT LIQUID
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
SA	SUPPLY AIR
SEER	SEASONAL ENERGY EFFICIENCY RATIO
TD	TRANSFER DUCT
TYP	TYPICAL
UNO	UNLESS NOTED (INDICATED) OTHERWISE
V	VOLTAGE, VOLTS
VD	VOLUME DAMPER
VFD	VARIABLE FREQUENCY DRIVE
VIF	VERIFY IN FIELD
W	WATT(S)
W/	WITH
W/O	WITHOUT
WB	WET BULB TEMPERATURE
WC	WATER COLUMN
WPD	WATER PRESSURE DROP
WWM	WELDED WIRE MESH

CONTROL SYMBOL LEGEND

- CIRCULATOR OR PUMP
- MOTORIZED 2-WAY VALVE
- MOTORIZED 3-WAY VALVE
- VFD — VARIABLE FREQUENCY DRIVE
- DDC — DIRECT DIGITAL CONTROLLER
- T — THERMOSTAT
- FZ — FREEZESTAT
- C — CONTACTOR
- R — RELAY
- S — SPACE TEMPERATURE SENSOR
- T — LINE VOLTAGE THERMOSTAT
- H / O / A — HAND-OFF-AUTOMATIC SWITCH
- SD — DUCT-MOUNTED SMOKE DETECTOR
- TRANSFORMER
- FUSE
- NORMALLY OPEN CONTACT
- NORMALLY CLOSED CONTACT
- WIRING OR DEVICE PROVIDED UNDER DIVISION 23
- WIRING OR DEVICE NOT PROVIDED UNDER DIVISION 23
- WIRING CONNECTION BY DIVISION 23
- WIRING CONNECTION BY OTHERS
- NUMBER OF CONDUCTORS INDICATED BY SLASH MARKS
- MOTORIZED PARALLEL BLADE DAMPER
- MOTORIZED OPPOSED BLADE DAMPER
- MOTORIZED BUTTERFLY BLADE DAMPER
- SUPPLY, RETURN, OR EXHAUST FAN
- AIRFLOW DIRECTION
- AI / TS — CONTROL POINT INDICATOR: INPUT OR OUTPUT (ANALOG INPUT); DEVICE TYPE (AIR TEMPERATURE SENSOR)
- AI / TS — CONTROL POINT INDICATOR: INPUT OR OUTPUT (ANALOG INPUT); DEVICE TYPE (AIR TEMPERATURE SENSOR WITH AVERAGING ELEMENT)
- AI / TS — CONTROL POINT INDICATOR: INPUT OR OUTPUT (ANALOG INPUT); DEVICE TYPE (WATER TEMPERATURE SENSOR WITH BULB TYPE ELEMENT IN PIPING WELL)
- AI / CSR — CONTROL POINT INDICATOR: INPUT OR OUTPUT (ANALOG INPUT); DEVICE TYPE (CURRENT SENSING RELAY)

GENERAL NOTES

A. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.

B. DRAWINGS ARE DIAGRAMMATIC AND INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY. DO NOT SCALE DRAWINGS. LOCATIONS OF ALL ITEMS INDICATED ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT DEFINITIVELY FIXED BY DIMENSIONS ARE APPROXIMATE. COORDINATE CONTRACT DOCUMENTS PROJECT REQUIREMENTS, WORK OF OTHERS, AND EQUIPMENT AND MATERIALS PURCHASED WITH FIELD DIMENSIONS, MANUFACTURER'S REQUIREMENTS FOR INSTALLATION, OPERATION, AND MAINTENANCE. CONTRACTOR'S INTENDED MEANS AND METHODS OF INSTALLATION, AND CONTRACTOR'S FABRICATED ITEMS TO ENSURE A PROPER FIT AND INSTALLATION.

C. MAINTAIN MAXIMUM HEADROOM AND SPACE CONDITIONS AT ALL POINTS. WHERE HEADROOM AND SPACE CONDITIONS APPEAR INADEQUATE, NOTIFY THE ARCHITECTS PRIOR TO PROCEEDING WITH INSTALLATION. MAINTAIN A MINIMUM OF 7'-0" CLEARANCE ABOVE FINISHED FLOOR TO UNDERSIDE OF PIPES, DUCTS, CONDUITS, SUSPENDED EQUIPMENT, ETC., THROUGHOUT ACCESS ROUTES IN MECHANICAL ROOMS.

D. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION. MAKE MODIFICATIONS IN THE LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES OR FOR PROPER EXECUTION OF THE WORK.

E. INSTALL ALL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.

F. COORDINATE LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS WITH ALL OTHER TRADES. COORDINATE ALL PIPING AND EQUIPMENT SUPPORTED FROM STRUCTURE WITH GENERAL CONSTRUCTION WORK.

G. PROVIDE TRAPPED DRAIN PIPING FROM DRAIN PANS OF ALL COOLING COILS, FANS AND OTHER ACTIVE DRAINS EXPOSED TO SYSTEM AIRSTREAM. PROVIDE TRAP AT CONNECTION WITH WATER SEAL DEPTH ONE INCH GREATER THAN UNIT OPERATING PRESSURE. DIRECT DRAINS TO NEAREST FLOOR DRAIN, MOP SINK, OR OTHER LOCATION APPROVED BY THE ARCHITECT.

H. INSTALL PIPING, DUCTWORK, AND CONDUIT CONCEALED IN AREAS HAVING CEILINGS AND/OR FURRED SPACES UNLESS OTHERWISE INDICATED.

I. ALL EQUIPMENT, VALVES, DAMPERS, DAMPER AND VALVE OPERATORS SHALL BE PROVIDED WITH ADEQUATE ACCESS FOR SERVICING, MAINTENANCE, AND REPLACEMENT.

J. SIZE ALL SPLIT-SYSTEM REFRIGERANT PIPING IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.

K. DUCT DIMENSIONS MAY BE MODIFIED ONLY WITH PRIOR APPROVAL FROM ARCHITECT. DUCT DIMENSIONS ARE IN INCHES AND INSIDE CLEAR.

L. FOR LOCATION OF REGISTERS, GRILLES, AND DIFFUSERS WITHIN CEILING GRID, REFER TO ARCHITECTURAL REFLECTED CEILING PLANS.

M. ELEVATION INDICATED FOR RECTANGULAR DUCT, GRILLE AND LOUVER OPENINGS IS TO THE TOP OF ROUGH OPENING UNLESS OTHERWISE INDICATED. ELEVATION INDICATED FOR ROUND DUCTWORK AND PIPING IS TO CENTERLINE.

N. BRANCH PIPING RUNOUTS TO TERMINAL UNITS SHALL BE 3/4" DIAMETER UNLESS INDICATED OTHERWISE.

O. REFER TO STRUCTURAL DRAWINGS FOR DETAILS AND MAXIMUM SPACING REQUIREMENTS REGARDING HANGER ATTACHMENTS TO STEEL BAR JOISTS.

GRAPHIC SYMBOL LEGEND

- CORRIDOR / A101 — **SPACE TAG**: SPACE NAME; SPACE NUMBER; BUILDING "PART" NUMBER IN MULTI-PART BUILDING
- AHU-12 — **EQUIPMENT TAG**: EQUIPMENT NUMBER; EQUIPMENT ABBREVIATION
- S1 / 325 — **DIFFUSER, GRILLE OR REGISTER TAG**: TAG, REFER TO DIFFUSER, GRILLE AND REGISTER SCHEDULE; AIRFLOW (CFM)
- 1 / M5.1 — **DETAIL TAG**: DETAIL NUMBER; DRAWING WHERE DETAIL IS INDICATED
- 15 — KEYNOTE
- C — STRUCTURAL GRID LINE WITH DESIGNATION
- EXC — EXISTING STRUCTURAL GRID LINE WITH DESIGNATION
- EXISTING TO BE REMOVED
- N — PLAN NORTH; TRUE NORTH ARROW
- 1 / M5.1 / M2.2 / M2.3 / M2.4 — **DETAIL TITLE**: 1/4"=1'-0"; DETAIL NUMBER; DRAWING WHERE DETAIL IS INDICATED; DRAWING WHERE DETAIL IS REFERENCED; ADDITIONAL DRAWING REFERENCES
- 1 / M4.1 / M2.2 / M2.3 / M2.4 — **SECTION TITLE**: 1/4"=1'-0"; SECTION NUMBER; DRAWING WHERE SECTION IS INDICATED; DRAWING WHERE SECTION IS REFERENCED; ADDITIONAL DRAWING REFERENCES
- 1 / M4.1 — **SECTION CALLOUT**: SECTION NUMBER; DRAWING WHERE SECTION IS INDICATED
- 1 / M3.1 — **ENLARGED PLAN CALLOUT**: ENLARGED PLAN NUMBER; DRAWING WHERE ENLARGED PLAN IS INDICATED
- MECHANICAL EQUIPMENT WITH REQUIRED SERVICE CLEARANCE INDICATED

DUCTWORK LEGEND

- 18x8 — RECTANGULAR DUCT (FIRST DIMENSION REFERS TO SIDE VIEWED)
- 18ø — ROUND DUCT SIZE
- 18/12 — FLAT OVAL DUCT SIZE
- 18ø — DOUBLE WALL, EXPOSED DUCT
- 18ø — FABRIC DUCT
- FLEXIBLE DUCTWORK
- FLEXIBLE CONNECTOR
- SD — DUCT-MOUNTED SMOKE DETECTOR
- DUCT WITH DUCT LINER
- DUCT ACCESS DOOR
- DUCT WITH END CAP
- LINEAR SLOT DIFFUSER, LENGTH AS INDICATED
- LINEAR BAR GRILLE, LENGTH AS INDICATED
- SUPPLY DIFFUSER
- RETURN OR EXHAUST GRILLE
- SUPPLY DIFFUSER WITH DIRECTIONAL BLOW, SOLID HATCH INDICATES BLANK OFF PANEL
- POINT OF CONNECTION TO EXISTING
- LIMIT OF DEMOLITION
- SUPPLY AIRFLOW ARROW
- RETURN OR EXHAUST AIRFLOW ARROW
- UC — DOOR UNDERCUT
- DL — DOOR LOUVER
- SENSOR WELL
- MANUAL BALANCING DAMPER IN DUCT
- FIRE DAMPER IN DUCT
- SMOKE DAMPER IN DUCT
- COMBINATION FIRE/SMOKE DAMPER IN DUCT
- SB — FIRE DAMPER WITH SECURITY BARS IN DUCT
- SB — SMOKE DAMPER WITH SECURITY BARS IN DUCT
- SB — COMBINATION FIRE/SMOKE DAMPER WITH SECURITY BARS IN DUCT
- M — MOTORIZED DAMPER IN DUCT
- M — SMOKE CONTROL MANUAL BALANCING DAMPER IN DUCT
- M — SMOKE CONTROL MOTORIZED DAMPER IN DUCT
- SB — SECURITY BARS IN DUCT
- AP — DUCT WITH ACCESS PANEL
- TO / AWAY — SUPPLY/MAKEUP AIR DUCT SECTIONS
- TO / AWAY — RETURN AIR DUCT SECTIONS
- TO / AWAY — EXHAUST AIR DUCT SECTIONS
- SD — SMOKE DETECTOR
- H — HUMIDITY SENSOR
- T — THERMOSTAT, LINE VOLTAGE
- T — THERMOSTAT, LOW VOLTAGE
- S — TEMPERATURE SENSOR
- C — CARBON DIOXIDE SENSOR
- CM — CARBON MONOXIDE SENSOR

PIPING LEGEND

- CO — END OF LINE CLEANOUT PLUG
- CO — CLEANOUT PLUG
- PRESSURE GAUGE WITH GAUGE COCK
- LIQUID FILLED THERMOMETER
- UNION
- STRAINER WITH BLOWDOWN VALVE AND 3/4" HOSE END CONNECTION
- FLEXIBLE PIPE CONNECTOR
- MA — MANUAL AIR VENT
- VALVE
- MANUAL BALANCING VALVE WITH FLOW TAPS
- AUTOMATIC BALANCING VALVE WITH FLOW TAPS
- SWING CHECK VALVE
- PRESSURE REDUCING VALVE
- TRIPLE DUTY VALVE
- GAS COCK
- P — PRESSURE-RELIEF VALVE
- M — TWO-WAY CONTROL VALVE
- M — THREE-WAY CONTROL VALVE
- DIRECTION OF FLOW

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

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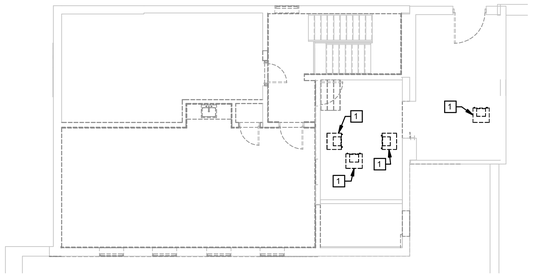
GENERAL DEMOLITION NOTES

1. EXISTING MATERIALS AND ITEMS NOT USED FOR NEW CONSTRUCTION INCLUDING, BUT NOT LIMITED TO, UNIT HEATERS, EXHAUST FANS, PIPING, DUCTS, HANGERS, DRAINS, ETC. SHALL BE REMOVED AND NOT ABANDONED IN PLACE UNLESS REMOVAL IS NOT POSSIBLE (AS DETERMINED BY THE ARCHITECTOWNER).

KEYNOTES

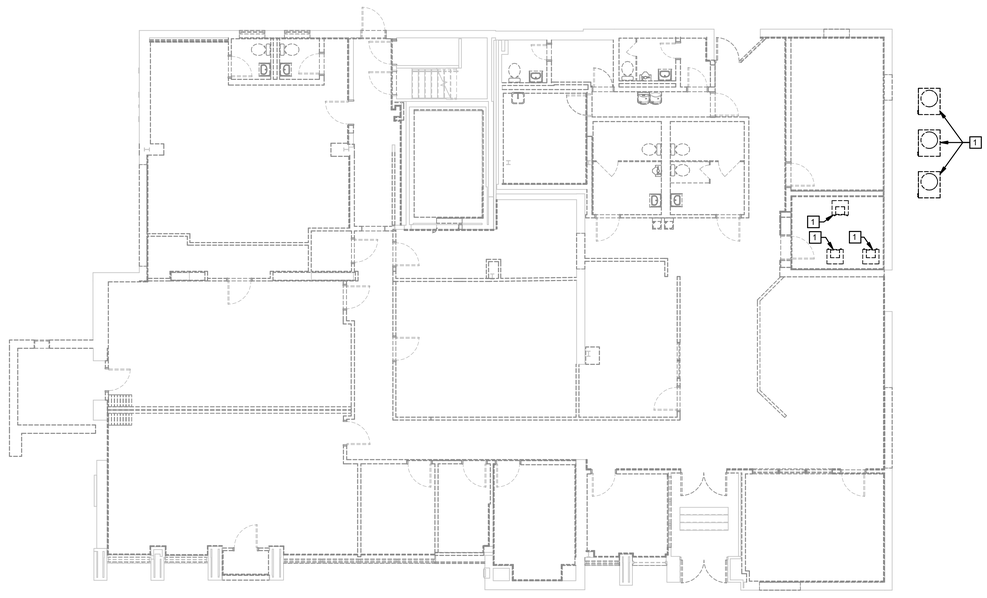
APPLIES TO THIS DRAWING

1 REMOVE AIR HANDLING UNIT / CONDENSING UNIT AND ALL ASSOCIATED EQUIPMENT PADS, PIPING, DUCTWORK, AND CONTROLS. CAPTURE REFRIGERANT AND DISPOSE IN ACCORDANCE WITH APPLICABLE LAWS.



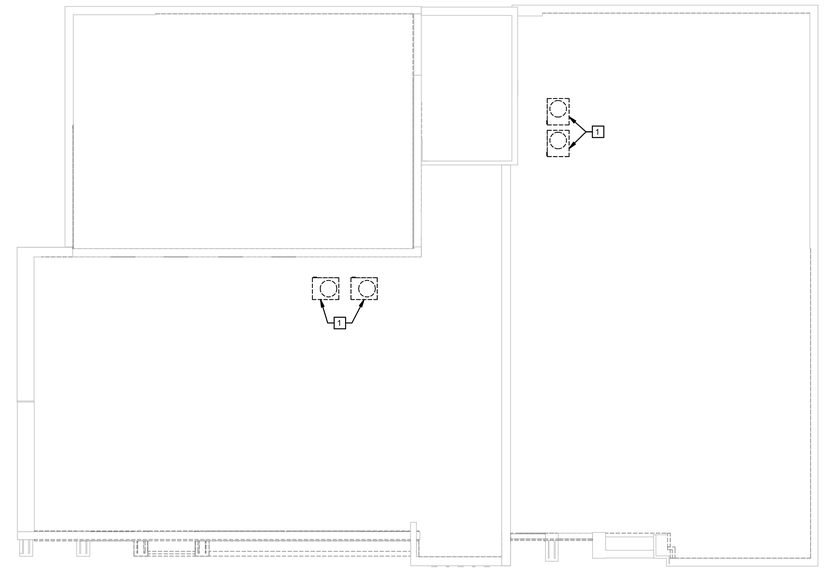
SECOND FLOOR PLAN - DEMOLITION

1/8" = 1'-0"



FIRST FLOOR PLAN - DEMOLITION

1/8" = 1'-0"



ROOF PLAN - DEMOLITION

1/8" = 1'-0"

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3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
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COMMONWEALTH OF VIRGINIA
DAVID T. WHATELY
Lic. No. 052209
10/21/2026
PROFESSIONAL ENGINEER

0' 2' 4' 8' 16'
1/8"=1'-0"

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

MECHANICAL DEMOLITION PLAN

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ROOM SCHEDULE

NUMBER	NAME
100	VESTIBULE
101	WAITING/ LOBBY
102	COMMUNITY ROOM
102A	COMM STOR
103	PUBLIC TOILET
104	RECEPTION
105	CORRIDOR
106	WELLNESS
107	KITCHEN/ BREAK
108	CONFERENCE
110	CORRIDOR
111	CORRIDOR
112	GUN STORAGE
113	JANITOR
114	EVIDENCE SUPPLY
115	STAFF TLT
116	EVIDENCE PROCESSING
116A	EVIDENCE STORAGE
117	EVIDENCE HOLDING
118	REPORT WRITING
119	STAFF TLT
120	LOCKERS
121	SHOWER
122	STAFF TLT
123	SERGEANTS
124	LIEUTENANT
125	CORRIDOR
126	INTERVIEW
127	INTERVIEW TOILET
128	EXIT VESTIBULE
129	SECURE DATA
130	INVESTIGATORS, INVESTIGATIONS ADMIN ASSISTANT

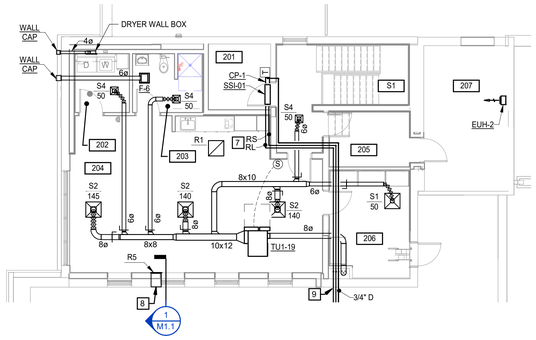
ROOM SCHEDULE

NUMBER	NAME
130A	FILES/PRINT
131	LIEUTENANT
132	DEPUTY CHIEF
133	CORRIDOR
134	POLICE ADMIN
135	ACCREDIDATION MANAGER
136	POLICE CHIEF
137	COPY
138	REPORT TAKING
139	CORRIDOR
140	HEARING
141	PROCESSING / BOOKING
142	BOOKING TOILET
143	INTOXILIZER
144	HOLDING CELL
145	GENERAL STORAGE/ QUARTERMASTER
145A	GUN CLEANING
146	SALLYPORT
147	WAITING
148	HEARING
149	MAGISTRATE
150	CHIEF MAGISTRATE
151	TOILET
152	MECHANICAL
201	DATA
202	LAUNDRY
203	TLT/SHOWER
204	FUTURE GROWTH AREA
205	CORR
206	STORAGE
207	ELECTRICAL
S1	STAIR

KEYNOTES

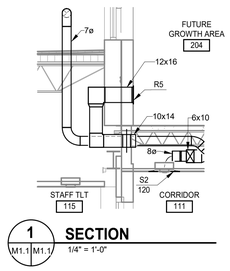
APPLIES TO THIS DRAWING

1. 6ø TO 3ø CONNECTION TO TASK EXHAUSTER.
2. GOOSENECK TERMINATION ON ROOF.
3. OPEN END DUCT. PROVIDE 1/2" x 1/2"WELDED WIRE MESH OVER DUCT OPENING.
4. GOOSENECK TERMINATION ON ROOF. LOCATE MINIMUM OF 2' FROM CLERESTORY WALL.
5. GAS WATER HEATER FLUE VENT WITH TERMINATION ON ROOF. SIZE AND INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
6. GAS WATER HEATER INTAKE. REFER TO PLUMBING DRAWINGS FOR CONTINUATION. SIZE AND INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
7. SIZE AND INSTALL REFRIGERANT SUCTION AND LIQUID PIPING IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
8. MOUNT DIFFUSER CENTERLINE AT 2'-0" AFF. SIDEWALL DUCT TO ABOVE CEILING SPACE ON FIRST FLOOR.
9. SIDEWALL PENETRATION TO ROOF.
10. 14x14 UP TO F-2 ON ROOF.
11. 8x8 DUCT UP TO F-3 ON ROOF.
12. 10x10 DUCT UP TO F-4 ON ROOF.
13. 8x8 DUCT UP TO F-5 ON ROOF.
14. 10X10 DUCT UP TO F-7 ON ROOF.
15. 10x10 DUCT UP TO F-8 ON ROOF.
16. 12x12 DUCT UP TO GV-1 ON ROOF.
17. 16x12 DUCT UP TO RTU-2 ON ROOF.
18. 76x14 DUCT UP TO RTU-1 ON ROOF. PROVIDE 1" DUCT LINER FOR RETURN DUCTWORK ASSOCIATED WITH RTU-1 AND UP TO RTU-1 RETURN AIR CONNECTION.
19. 34/18 DUCT UP TO RTU-1 ON ROOF.
20. 8ø DUCT UP TO SECOND FLOOR.
21. DEHUMIDIFIER FURNISHED BY OWNER.
22. PROVIDE 8' MINIMUM FLEX DUCTWORK FOR SOUND ATTENUATION.
23. MOUNT F-1 WITH UNISTRUT ABOVE CEILING AND LOCATE FOR PROPER MAINTENANCE ACCESS. REFER TO STRUCTURAL DRAWINGS.
24. PROVIDE MANUAL VOLUME DAMPER IN VERTICAL.
25. 14x10 DUCT UP TO SECOND FLOOR.
26. PROVIDE 1" DUCT LINER FROM RTU-1 SUPPLY DISCHARGE UP TO THIS POINT.



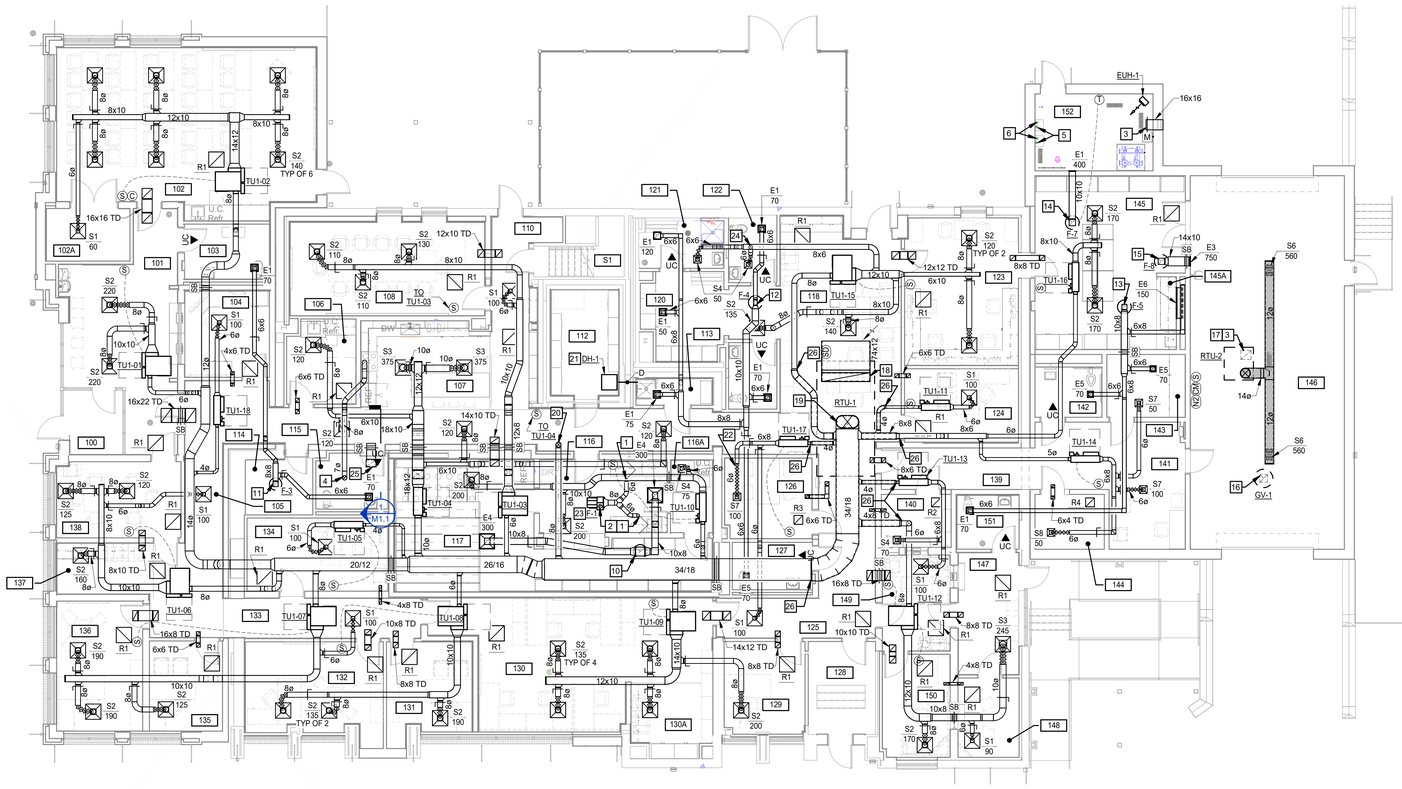
SECOND FLOOR PLAN

1/8" = 1'-0"



1 M1.1 **SECTION**

1/4" = 1'-0"



FIRST FLOOR PLAN

1/8" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

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0' 2' 4' 8' 16'
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SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
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FLOOR PLANS

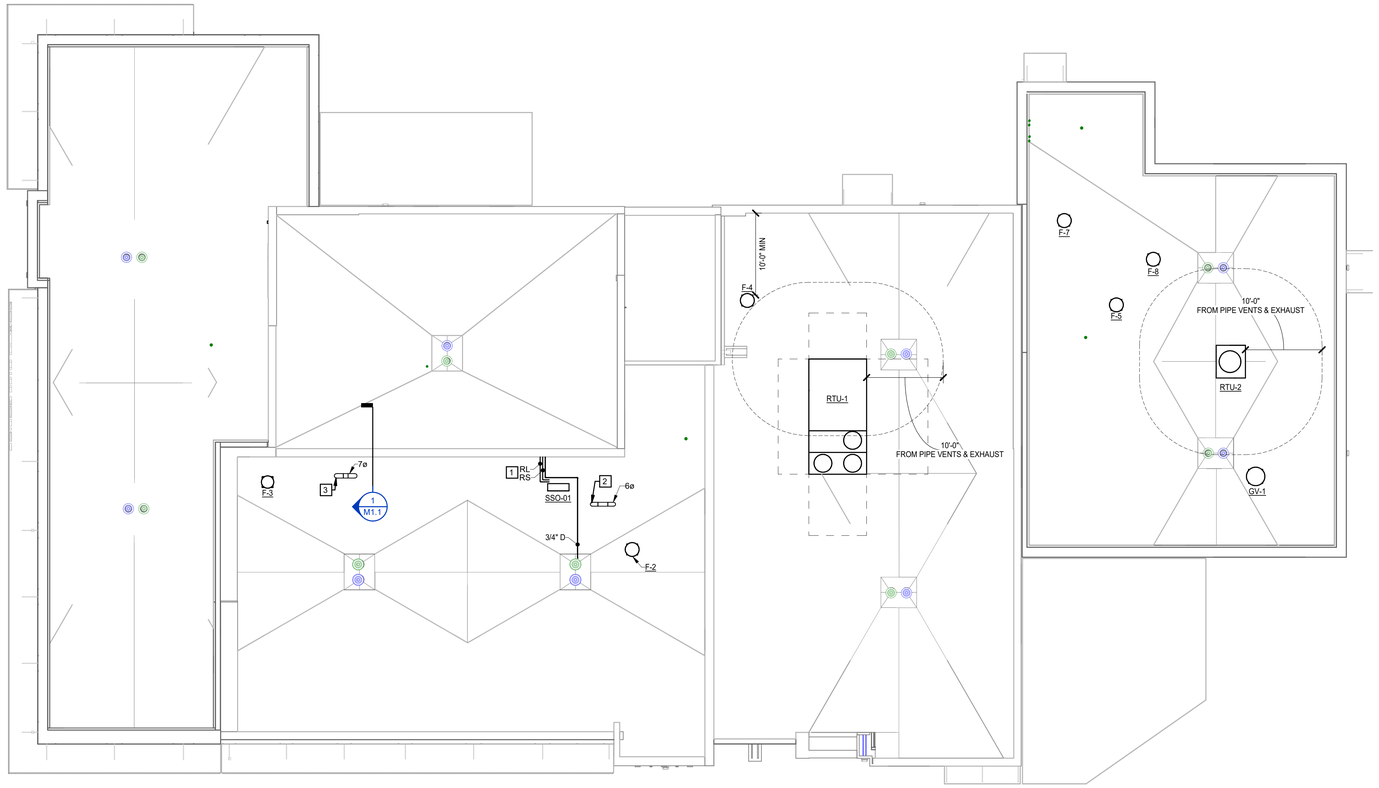
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KEYNOTES

APPLIES TO THIS DRAWING

1	SIZE AND INSTALL REFRIGERANT SUCTION AND LIQUID PIPING IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2	6ø DUCT DOWN TO F-1 ON FIRST FLOOR.
3	7ø DUCT FOR RANGEHOOD DOWN TO FIRST FLOOR.



ROOF PLAN

1/8" = 1'-0"

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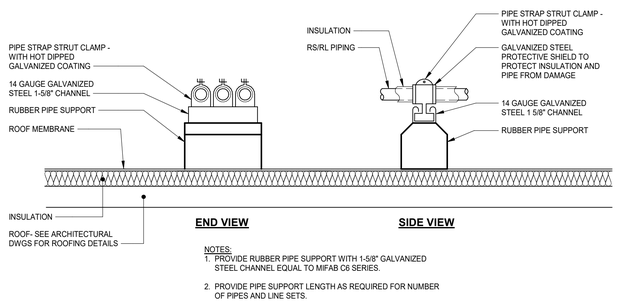
REVISIONS

DATE	DESCRIPTION

ROOF PLAN

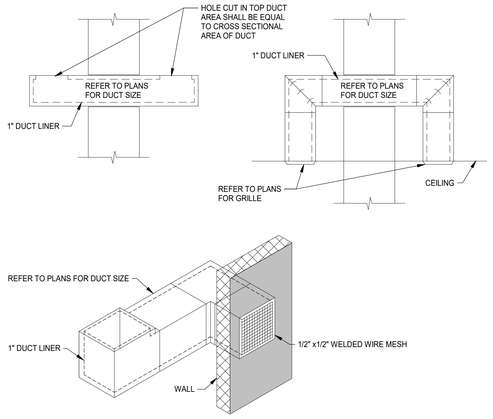
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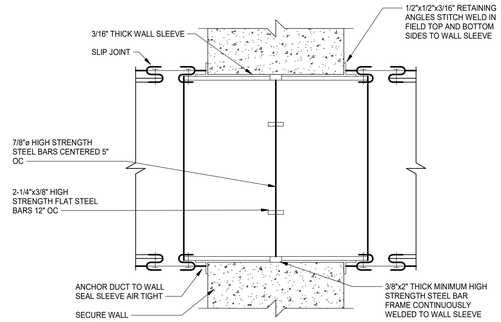


NOTES:
1. PROVIDE RUBBER PIPE SUPPORT WITH 1-5/8" GALVANIZED STEEL CHANNEL EQUAL TO MIFAB C6 SERIES.
2. PROVIDE PIPE SUPPORT LENGTH AS REQUIRED FOR NUMBER OF PIPES AND LINE SETS.

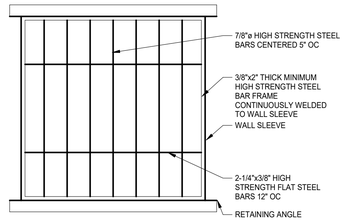
REFRIGERANT ROOF PIPE SUPPORT DETAIL



TRANSFER DUCT DETAIL



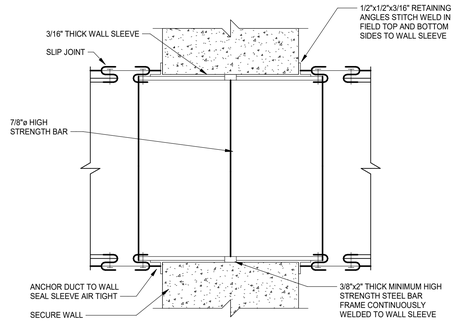
SECTION VIEW



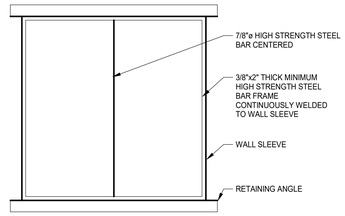
ELEVATION

NOTE: FOR DUCTWORK WITH INSIDE CLEAR DIMENSIONS GREATER THAN 12x12

INTERIOR SECURITY WALL - DUCT MOUNTED SECURITY BAR DETAIL - LARGE



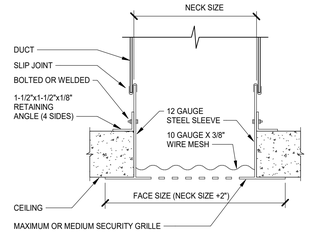
SECTION VIEW



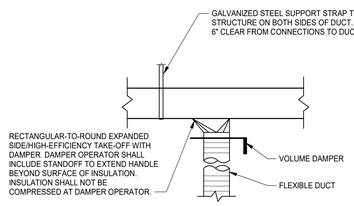
ELEVATION

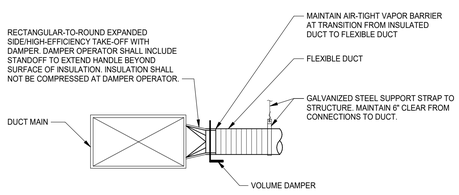
NOTE: FOR DUCTWORK WITH INSIDE CLEAR DIMENSIONS LESS THAN OR EQUAL TO 12x12

INTERIOR SECURITY WALL - DUCT MOUNTED SECURITY BAR DETAIL - SMALL



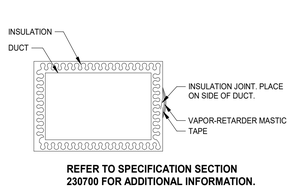
SECURITY GRILLE DETAIL





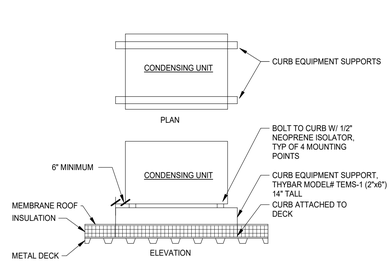
NOTES:
1. FLEXIBLE DUCT SHALL BE INSTALLED OVER METAL DUCT (BEAD/LIP ON METAL DUCT) AND ANCHORED WITH NYLON MECHANICAL BANDS OR PANDUIT STRAP.
2. IN EXPOSED AREAS, PROVIDE RIGID GALVANIZED STEEL BRANCH DUCT TO DIFFUSERS IN LIEU OF FLEXIBLE DUCT UNLESS INDICATED OTHERWISE. SUPPORT IN ACCORDANCE WITH REQUIREMENTS SPECIFIED FOR METAL DUCTS.
3. HANGERS AND SUPPORT STRAPS SHALL COMPLY WITH SECTION 233113, HANGERS AND SUPPORTS PARAGRAPH.

BRANCH CONNECTION TO DIFFUSER DETAILS

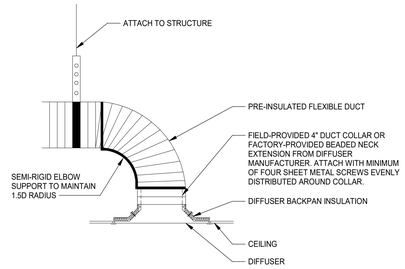


REFER TO SPECIFICATION SECTION 230700 FOR ADDITIONAL INFORMATION.

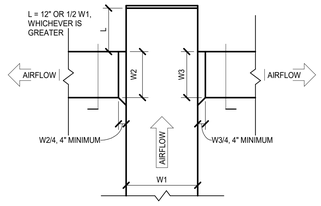
DUCT INSULATION JOINT DETAIL



CONDENSING UNIT MOUNTING DETAIL

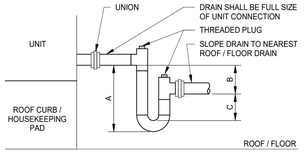


FLEXIBLE DUCT TO DIFFUSER CONNECTION DETAIL



NOTE:
1. REFER TO *BRANCH CONNECTION TO DIFFUSER DETAILS* FOR BRANCH TAKE-OFF REQUIREMENTS.

END OF DUCT MAIN DETAIL

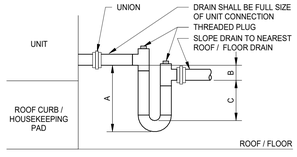


NEGATIVE PRESSURE TRAP

A = B + C + PIPE DIAMETER WHERE:

B = 1" FOR EACH INCH OF NEGATIVE STATIC PRESSURE + 1"

C = 1/2 OF B



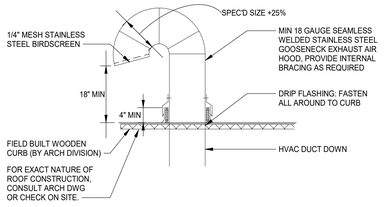
POSITIVE PRESSURE TRAP

A = B + C + PIPE DIAMETER WHERE:

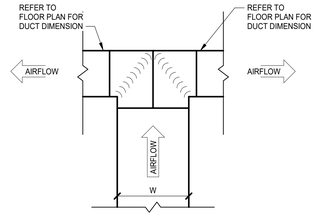
B = 1" MINIMUM

C = 1" + MAXIMUM UNIT POSITIVE STATIC PRESSURE AT COIL DISCHARGE

CONDENSATE DRAIN PIPING DETAIL

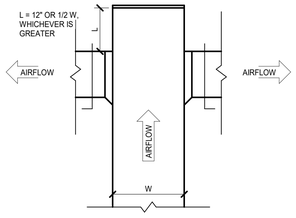


GOOSENECK DETAIL



NOTES:
1. APPLIES WHERE "W" EXCEEDS 24" OR WHEN AIRFLOW EXCEEDS 1,500 CFM.

DIVIDED FLOW BRANCH DETAILS



NOTES:
1. REFER TO *BRANCH CONNECTION TO DIFFUSER DETAILS* FOR BRANCH TAKE-OFF REQUIREMENTS.
2. APPLIES TO:
   A. WHERE "W" IS LESS THAN 24"
   B. ROUND DUCT BRANCHES TO DIFFUSERS
   C. WHEN AIRFLOW IS EQUAL TO OR LESS THAN 1,500 CFM.

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SOUTH HILL NEW POLICE STATION

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SOUTH HILL NEW POLICE STATION

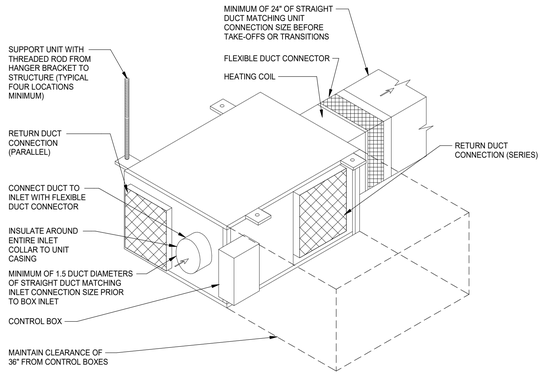
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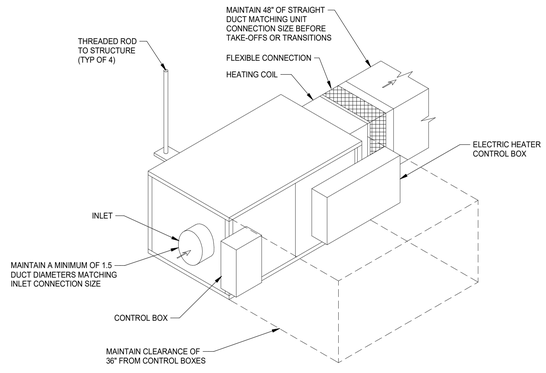
REVISIONS	
DATE	DESCRIPTION

DETAILS

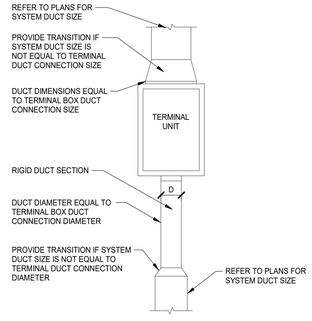
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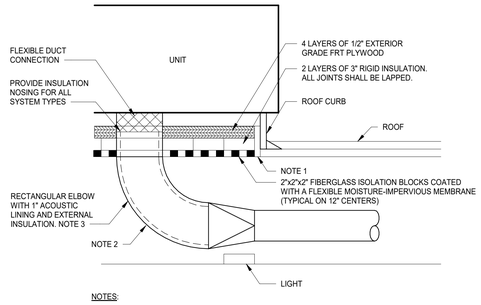
FAN-POWERED VAV TERMINAL UNIT DETAIL



VAV TERMINAL UNIT DETAIL



TERMINAL DUCT CONNECTION DETAIL



RTU-1 DETAIL

NOTES:

1. PERIMETER ISOLATION SHALL BE 3" RIGID INSULATION TURNED HORIZONTALLY. THIS SHALL BE LOCATED ON ALL INTERIOR SURFACES (CURB WALLS, DUCT SIDES, PIPING, ETC.) SO THAT PLYWOOD DOES NOT CONTACT ANY SURFACE OTHER THAN PERIMETER RAIL. PLYWOOD SHALL BE FITTED FIRMLY AGAINST PERIMETER RAIL. ANY GAPS SHALL BE CAULKED WITH A NON-HARDENING, HEAVY BODIES MATERIAL SUCH AS "SIKA-MI" ARCHITECTURAL JOINT CAULK. MAXIMUM GAP SHALL BE 3/8"
2. 1.5 D RADIUS ELBOW SHOWN. PROVIDE SHORT RADIUS ELBOW WHERE REQUIRED FOR LIMITED CEILING SPACE.
3. ELBOW SHALL BE HEAVY GAUGE WITH 1" ACOUSTIC LINING.
   MEDIUM PRESSURE VAV SYSTEMS - 12 GAUGE
   LOW PRESSURE SINGLE ZONE UNITS - 16 GAUGE

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PACKAGED VARIABLE AIR VOLUME ROOFTOP UNIT SCHEDULE

			SUPPLY FAN						OUTSIDE AIR	DX COOLING COIL							ELECTRIC HEATING COIL			ELECTRIC DATA						
						FAN WHEEL						EAT		LAT						UNIT DATA		SERVICE			
TAG	MANUFACTURER	MODEL NUMBER	DESIGN AIRFLOW (CFM)	MINIMUM AIRFLOW (CFM)	ESP (IN WC)	TYPE	FAN SPEED (RPM)	MOTOR SIZE EACH (HP)	DESIGN AIRFLOW (CFM)	GROSS TOTAL CAPACITY (BTUH)	GROSS SENSIBLE CAPACITY (BTUH)	(°F DB)	(°F WB)	(°F DB)	(°F WB)	EER	CAPACITY (KW)	EAT (°F)	LAT (°F)	MCA (A)	MOCP (A)	(V)	(PH)	(HZ)	WEIGHT (LBS)
RTU-1	TRANE	TED330	8,500	2,510	2.00	FC	723	10	1,900	335,370	235,200	80.0	67.0	53.9	53.8	11	36	54.0	65.8	167.0	200	208	3	60	4,742

GENERAL NOTES:
A. PROVIDE FACTORY MOUNTED DISCONNECT.
B. PROVIDE SINGLE POINT POWER CONNECTION.
C. PROVIDE WITH 100% POWER EXHAUST WITH BUILDING PRESSURE CONTROL.
D. PROVIDE WITH SCR MODULATING ELECTRIC HEAT.

FAN POWERED TERMINAL UNIT SCHEDULE

			AIR VALVE				FAN				COIL					ELECTRICAL DATA						
																			SERVICE			
TAG	MANUFACTURER	MODEL NUMBER	INLET DIAMETER (IN)	MAXIMUM AIR FLOW (CFM)	MINIMUM AIR FLOW (CFM)	APD AT MAXIMUM AIR FLOW (IN WC)	FAN SIZE	MOTOR (HP)	AIRFLOW (CFM)	ESP (IN WC)	DESIGN AIRFLOW (CFM)	CAPACITY (KW)	EAT (°F)	LAT (°F)	STAGES (NO)	FLA (A)	MCA (A)	MOCP (A)	(V)	(PH)	(HZ)	WEIGHT (LBS)
TU1-01	TRANE	VPEG	6	440	70	0.15	SMALL	1/3	370	0.25	440	5.5	55.0	83.2	2	18.4	23.0	25	208	3	60	120
TU1-02	TRANE	VPEG	8	900	300	0.06	SMALL	1/3	600	0.25	900	6.0	55.0	86.0	2	19.8	24.7	25	208	3	60	120
TU1-03	TRANE	VPEG	6	450	130	0.11	SMALL	1/3	320	0.25	450	3.0	55.0	86.7	2	17.5	21.9	25	208	1	60	120
TU1-06	TRANE	VPEG	8	505	105	0.02	SMALL	1/3	400	0.25	505	3.0	55.0	85.6	2	17.5	21.9	25	208	1	60	120
TU1-07	TRANE	VPEG	8	605	105	0.04	SMALL	1/3	500	0.25	605	4.0	55.0	88.2	2	14.2	17.8	20	208	3	60	120
TU1-08	TRANE	VPEG	6	460	60	0.17	SMALL	1/3	400	0.25	460	3.5	55.0	92.0	2	19.9	24.9	25	208	1	60	120
TU1-09	TRANE	VPEG	8	740	105	0.07	SMALL	1/3	635	0.25	740	5.0	55.0	89.1	2	17.0	21.2	25	208	3	60	120
TU1-12	TRANE	VPEG	8	505	105	0.02	SMALL	1/3	400	0.25	505	4.5	55.0	94.9	2	15.6	19.5	20	208	3	60	120
TU1-15	TRANE	VPEG	8	615	120	0.04	SMALL	1/3	495	0.25	615	3.5	55.0	85.0	2	12.8	16.0	20	208	1	60	120
TU1-19	TRANE	VPEG	8	625	105	0.04	SMALL	1/3	520	0.25	625	5.0	55.0	92.7	2	17.0	21.2	25	208	3	60	120

GENERAL NOTES:
A. PROVIDE FACTORY MOUNTED DISCONNECT.

TERMINAL UNIT SCHEDULE

			AIR VALVE				COIL					ELECTRICAL DATA						
															SERVICE			
TAG	MANUFACTURER	MODEL NUMBER	INLET DIAMETER (IN)	MAXIMUM AIRFLOW (CFM)	MINIMUM AIRFLOW (CFM)	APD AT MAX AIR FLOW (IN-WC)	DESIGN AIRFLOW (CFM)	CAPACITY (KW)	EAT (°F)	LAT (°F)	STAGES (NO)	FLA (A)	MCA (A)	MOCP (A)	(V)	(PH)	(HZ)	WEIGHT (LBS)
TU1-04	TRANE	VCEF	10	1,230	240	0.04	1230	2.0	55	81.2	2	16.7	20.8	25	120	1	60	120
TU1-05	TRANE	VCEF	4	100	85	0.01	100	1.0	55	92.0	1	8.3	10.4	15	120	1	60	120
TU1-10	TRANE	VCEF	6	475	170	0.14	475	1.5	55	82.8	2	12.5	15.6	20	120	1	60	120
TU1-11	TRANE	VCEF	4	100	85	0.01	100	1.0	55	92.0	1	8.3	10.4	15	120	1	60	120
TU1-13	TRANE	VCEF	4	170	85	0.01	170	1.0	55	92.0	1	8.3	10.4	15	120	1	60	120
TU1-14	TRANE	VCEF	5	200	125	0.01	200	1.5	55	92.8	2	12.5	15.6	20	120	1	60	120
TU1-16	TRANE	VCEF	6	340	340	0.10	340	3.0	55	82.8	2	25.0	31.3	35	120	1	60	120
TU1-17	TRANE	VCEF	4	200	90	0.01	200	1.0	55	90.0	1	8.3	10.4	15	120	1	60	120
TU1-18	TRANE	VCEF	4	100	85	0.01	100	1.0	55	92.0	1	8.3	10.4	15	120	1	60	120

GENERAL NOTES:
A. PROVIDE FACTORY MOUNTED DISCONNECT.

PACKAGED CONSTANT AIR VOLUME ROOFTOP UNIT SCHEDULE

			SUPPLY FAN			OUTSIDE AIR	DX COOLING COIL					NATURAL GAS BURNER			ELECTRIC DATA					
									EAT						UNIT DATA		SERVICE			
TAG	MANUFACTURER	MODEL NUMBER	DESIGN AIRFLOW (CFM)	MINIMUM AIRFLOW (CFM)	ESP (IN WC)	DESIGN AIRFLOW (CFM)	GROSS TOTAL CAPACITY (BTUH)	GROSS SENSIBLE CAPACITY (BTUH)	(°F DB)	(°F WB)	EER	CAPACITY (BTUH)	EAT (°F)	LAT (°F)	MCA (A)	MOCP (A)	(V)	(PH)	(HZ)	WEIGHT (LBS)
RTU-2	TRANE	5YCC4030	1,120	1,120	0.40	50	27,250	20,600	75.0	62.5	11	70,000	70.0	117.9	21.0	30.0	208	1	60	385

GENERAL NOTES:
A. DIV 26 TO PROVIDE DISCONNECT SWITCH.
B. PROVIDE OUTSIDE AIR HOOD WITH MANUAL CONTROL DAMPER.

DUCTLESS SPLIT SYSTEM INDOOR UNIT SCHEDULE

						INDOOR EAT (°F)		
TAG	MANUFACTURER	MODEL NUMBER	SERVING	SUPPLY AIR (CFM)	TOTAL CAPACITY (BTUH)	DB	WB	WEIGHT (LBS)
SSI-01	TRANE	TPKA-AL18NL	201-DATA	400	18,000	80	67	28

GENERAL NOTES:
A. INDOOR UNIT RECEIVES POWER FROM OUTDOOR UNIT. REFER TO DUCTLESS SPLIT SYSTEM OUTDOOR UNIT SCHEDULE FOR ELECTRICAL REQUIREMENTS.
B. DIV 26 SHALL PROVIDE DISCONNECT SWITCH.

DUCTLESS SPLIT SYSTEM OUTDOOR UNIT SCHEDULE

					ELECTRICAL DATA					REFRIGERANT		
							SERVICE					
	MANUFACTURER	MODEL NUMBER	LOCATION	AMBIENT AIR TEMPERATURE (°F)	MCA (A)	MOCP (A)	V	PH	HZ	TYPE	MAX CHARGE (LBS)	WEIGHT (LBS)
SSO-01	TRANE	TPUY-AK18NL	ROOF	95.0	16	20	208	1	60	R-454B	4.0	99

GENERAL NOTES:
A. INDOOR UNIT RECEIVES POWER FROM OUTDOOR UNIT.

CONDENSATE PUMP SCHEDULE

				OPERATING DATA			DISCHARGE SIZE (IN)	ELECTRICAL DATA		
TAG	MANUFACTURER	MODEL NUMBER	SERVING	FLOW (GPM)	HEAD (FT WC)	SUCTION SIZE (IN)		V	PH	HZ
CP-1	BLUE DIAMOND	MAXIBLUE	SSI-01	3.7	23	0.25	0.25	208	1	60

FAN SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	SERVING	TYPE	AIRFLOW (CFM)	ESP (IN WC)	FAN WHEEL (RPM)	DRIVE TYPE	SONES	CONTROL METHOD	MOTOR (HP)	ELECTRICAL DATA (V)	ELECTRICAL DATA (PH)	ELECTRICAL DATA (HZ)	WEIGHT (LBS)	NOTES
F-1	MOVEX	SPB-9	EVIDENCE ROOM TASK EXHAUSTERS	UTILITY SET	170	1.00	1750	DIRECT	9.9	WALL SWITCH	1/4	120	1	60	35	-
F-2	GREENHECK	G-90-VG	EVIDENCE ROOMS	ROOF MTD. CENTRIFUGAL	600	0.30	1546	DIRECT	7.4	BAS SCHEDULE	1/10	120	1	60	41	1, 2
F-3	GREENHECK	G-60-VG	103 & 115 TOILETS	ROOF MTD. CENTRIFUGAL	140	0.25	1654	DIRECT	4.2	BAS SCHEDULE	1/15	120	1	60	35	1, 2
F-4	GREENHECK	G-90-VG	119, 121, 122, 127 TOILETS	ROOF MTD. CENTRIFUGAL	455	0.25	1265	DIRECT	5.2	BAS SCHEDULE	1/10	120	1	60	41	1, 2
F-5	GREENHECK	G-90-VG	142 & 151 TOILETS, 143-INTOXILIZER, 145A-GUN CLEANING	ROOF MTD. CENTRIFUGAL	360	0.25	1503	DIRECT	6.8	BAS SCHEDULE	1/10	120	1	60	40	1, 2
F-6	GREENHECK	SP-A110	203-TLT/SHOWER	CEILING	120	0.10	950	DIRECT	0.3	WALL SWITCH	113 WATTS	120	1	60	17	1
F-7	GREENHECK	G-80-VG	152-MECHANICAL	ROOF MTD. CENTRIFUGAL	400	0.20	1540	DIRECT	7.2	LINE VOLTAGE T-STAT	1/10	120	1	60	40	1, 2
F-8	GREENHECK	G-90-VG	146-SALLYPORT	ROOF MTD. CENTRIFUGAL	750	0.20	1709	DIRECT	8.6	BAS SPECIAL	1/10	120	1	60	41	1, 2

NOTES:
1. PROVIDE FACTORY MOUNTED DISCONNECT.
2. PROVIDE MOTORIZED BACKDRAFT DAMPER.

GRILLE, REGISTER, & DIFFUSER SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	MOUNTING STYLE	NECK SIZE	FACE SIZE	MAX NC LEVEL	NOTES
S1	PRICE	ASCD	LAY-IN	6ø	24x24	25	-
S2	PRICE	ASCD	LAY-IN	8ø	24x24	25	-
S3	PRICE	ASCD	LAY-IN	10ø	24x24	25	-
S4	PRICE	ASCD	SURFACE	6ø	12x12	25	-
S6	PRICE	SDGE	DUCT	16x8	-	25	-
S7	PRICE	MSLP	SURFACE	6ø	12x12	25	-
S8	PRICE	MSPG	SURFACE	6ø	12x12	25	-
R1	PRICE	635-TB	LAY-IN	-	24x24	25	1
R2	PRICE	635-TB	LAY-IN	-	12x12	25	1
R3	PRICE	MSLP	SURFACE	-	12x12	25	-
R4	PRICE	MSPG	SURFACE	-	12x12	25	-
R5	PRICE	635-F	SURFACE	-	16x12	25	-
E1	PRICE	635-F	SURFACE	10x10	12x12	25	-
E3	PRICE	635-F	SURFACE	14x10	16x12	25	-
E4	PRICE	635-F	SURFACE	22x22	24x24	25	-
E5	PRICE	MSL	SURFACE	6X6	8X8	25	-
E6	PRICE	LBP 15A	SURFACE	48x1.5	-	25	-

NOTES:
1. PROVIDE WITH RETURN AIR CANOPY WITH PRICE AS BASIS OF DESIGN MFR.

ELECTRIC UNIT HEATER SCHEDULE

							ELECTRICAL DATA			
TAG	MANUFACTURER	MODEL NUMBER	LOCATION	TYPE	HEATING CAPACITY (KW)	AIRFLOW (CFM)	(V)	(PH)	(HZ)	WEIGHT (LBS)
EUH-1	TRANE	UHEC-03	152-MECHANICAL	CEILING	3.3	400	208	1	60	27
EUH-2	TRANE	UHEC-03	207-ELECTRICAL	CEILING	3.3	400	208	1	60	27

GENERAL NOTES:
A. PROVIDE FACTORY MOUNTED DISCONNECT.

GRAVITY VENT SCHEDULE

TAG	MANUFACTURER	MODEL NUMBER	SERVING	FUNCTION	AIRFLOW (CFM)	PRESSURE DROP (IN WC)	ROOF OPENING SIZE (IN x IN)	WEIGHT (LBS)
GV-1	GREENHECK	GRSI-12	146-SALLYPORT	INTAKE	750	0.140	15x15	30

GENERAL NOTES:
A. PROVIDE MOTORIZED BACKDRAFT DAMPER AND INTERLOCK WITH EXHAUST FAN F-8 OPERATION.

Moseley
3200 NORFOLK STREET . RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
DAVID T. WHATELY
Lic. No. 052209
10/21/2026
PROFESSIONAL ENGINEER

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

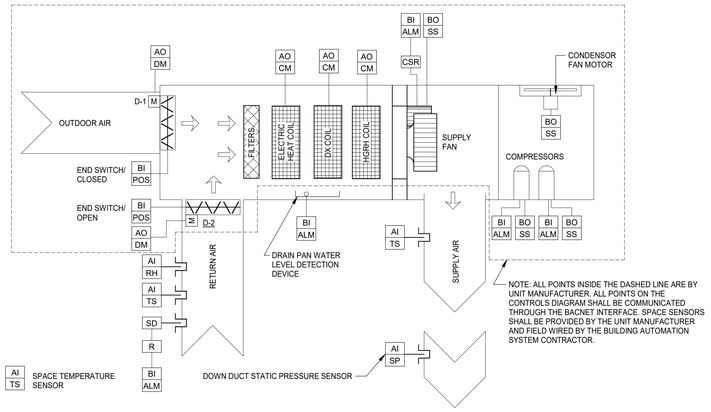
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SUBMITTAL: BID SET

REVISIONS
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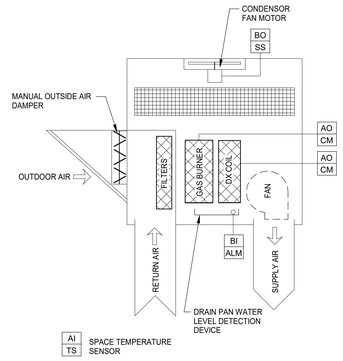
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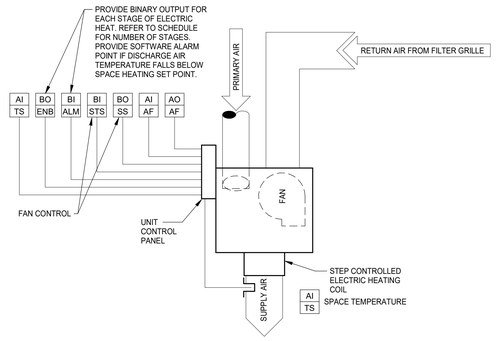
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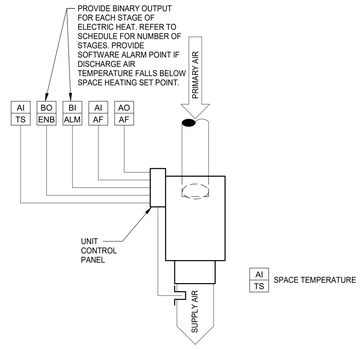
PACKAGED ROOFTOP UNIT - RTU-1



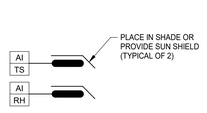
PACKAGED ROOFTOP UNIT - RTU-2



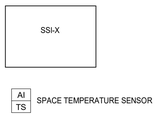
PARALLEL FAN POWERED TERMINAL UNIT WITH STEP CONTROLLED ELECTRIC HEAT



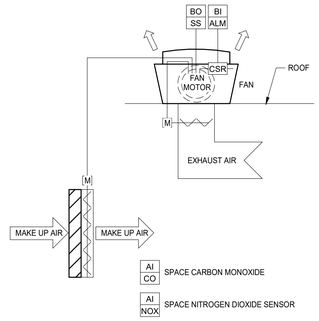
TERMINAL UNIT WITH STEP CONTROLLED ELECTRIC HEAT



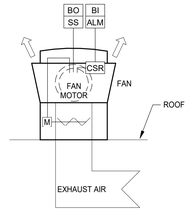
OUTDOOR AIR SENSORS



DUCTLESS SPLIT-SYSTEM AC UNITS



EXHAUST FAN FOR SALLYPORT - BAS SPECIAL



EXHAUST FAN - CONTROLLED BY BAS SCHEDULE

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
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SOUTH HILL NEW POLICE STATION

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PROJECT NO: 651033 DATE: OCTOBER 21, 2026
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REVISIONS	
DATE	DESCRIPTION

MECHANICAL CONTROL DIAGRAMS

M8.1

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GENERAL DEMOLITION NOTES

A. PROVIDE ALL ELECTRICAL DEMOLITION WORK REQUIRED TO INSTALL THE WORK INDICATED. REMOVE, REROUTE, AND RECONNECT ALL BRANCH CIRCUITS THAT WILL REMAIN IN USE BUT INTERFERES WITH THE WORK.

B. REMOVE ALL EXISTING CONDUITS THAT WILL NOT BE REUSED AND WHERE THEY WILL BE EXPOSED AFTER COMPLETION. ABANDON ALL OTHERS IN THE WALLS ONLY. DISCONNECT ALL WIRING INDICATED AND/OR REQUIRED TO BE REMOVED FROM ALL POWER SOURCES. REMOVE ALL WIRING FROM ABANDONED CONDUITS AND PROVIDE BLANK COVER PLATES FOR BOXES NOT UTILIZED FOR THE WORK.

C. MAINTAIN CONTINUITY OF ALL EXISTING CIRCUITS TO REMAIN OR PORTIONS THEREOF AFFECTED BY THE WORK.

D. BEFORE DEMOLITION, VERIFY WITH THE OWNER ALL EQUIPMENT TO BE SALVAGED TO OWNER AND NOT REMOVED FROM THE SITE. FOR ALL REMAINING EQUIPMENT INDICATED FOR REMOVAL (AND NOT RELOCATED), REMOVE AND DISPOSE IN A LEGAL MANNER.

E. EXERCISE CARE IN REMOVING DEMOLITION ITEMS. REPAIR OR REPLACE ALL DAMAGE CAUSED TO EXISTING CONSTRUCTION AND EQUIPMENT TO REMAIN.

F. DRAWINGS ARE BASED UPON EXISTING PLANS AND FIELD INVESTIGATION WITHOUT DEMOLITION. VISIT THE EXISTING BUILDING AND BECOME FAMILIAR WITH ALL EXISTING CONDITIONS AND EXAMINE ALL DRAWINGS TO AVOID CONFLICTS.

G. WHERE DEMOLITION OF TELECOMMUNICATIONS DEVICES OCCUR, REMOVE CABLING NOT INDICATED TO REMAIN BACK TO POINT OF ORIGIN.

H. DEMOLITION FLOOR PLANS ARE PROVIDED FOR REFERENCE ONLY TO AID IN DEFINING THE SCOPE OF DEMOLITION WORK.

DEMOLITION LEGEND

SYMBOL	DESCRIPTION
	REMOVE DEVICES, EQUIPMENT, IN ACCORDANCE WITH THE GENERAL DEMOLITION NOTES.
	DEVICES ARE EXISTING TO REMAIN.
	WITHIN HATCHED AREAS, DISCONNECT AND REMOVE ALL ELECTRICAL MATERIALS INCLUDING BUT NOT LIMITED TO LIGHTS, DEVICES, EQUIPMENT, SPEAKERS, FIRE ALARM, COMMUNICATIONS, AND CIRCUITRY.

SECURITY LEGEND

SYMBOL	DESCRIPTION
	DIRECTIONAL SECURITY MOTION DETECTOR, WALL MOUNT 6" BFC.
	OMNI-DIRECTIONAL SECURITY MOTION DETECTOR.
	CCTV MOUNTING LOCATION, CEILING MOUNT.
	CCTV MOUNTING LOCATION, WALL MOUNT.
	MOUNT 8' AFF UNO
DPS	DOOR POSITION SWITCH.
C	STATUS CONTACT.
CR	CARD READER, MOUNT AT 3'-10" AFF.
CK	CARD READER WITH KEYPAD, MOUNT AT 3'-10" AFF.
KP	REMOTE KEYPAD FOR SECURITY SYSTEM, MOUNT AT 3'-10" AFF.
DS	ELECTRIC DOOR STRIKE.
EL	ELECTRIC DOOR LOCK.
PL	PNEUMATIC DOOR LOCK.
MIC	CEILING MICROPHONE.
	DURESS ALARM PUSHBUTTON, MOUNT IN CASEWORK AS INDICATED.

ALL ELECTRICAL EQUIPMENT/DEVICES/ FIXTURES, CONDUITS, JUNCTION BOXES, WIRES/CABLES THAT ARE ABOVE THE CEILING SHALL BE PLENUM-RATED.

POWER DEVICE / EQUIPMENT LEGEND

SYMBOL	DESCRIPTION
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE TWO IN DETAIL:
	OVERHEAD DOOR CONTROLLER.
	DOORBELL PUSH BUTTON.
	EMERGENCY POWER OFF (E.P.O) SWITCH.
	HANDICAP DOOR OPERATOR SWITCH.
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE THREE IN DETAIL:
	NON-FUSIBLE DISCONNECT SWITCH.
	FUSIBLE DISCONNECT SWITCH.
	ENCLOSED CIRCUIT BREAKER, CHARACTERISTICS AS INDICATED.
	MANUAL MOTOR STARTER, OVERLOAD PROTECTION AS REQUIRED PER NAME PLATE RATINGS, WITH 'ON' INDICATOR PILOT LIGHT.
	MAGNETIC MOTOR STARTER, OVERLOAD RELAYS AS REQUIRED TO SERVE MANUFACTURER REQUIREMENTS OF EQUIPMENT SERVED. PROVIDE WITH HAND-OFF-AUTOMATIC SELECTOR SWITCH AND INDICATOR LIGHTS.
	COMBINATION MAGNETIC STARTER AND DISCONNECT SWITCH, OVERLOAD ELEMENTS AND FUSING AS REQUIRED TO SERVE MANUFACTURER REQUIREMENTS OF EQUIPMENT SERVED. PROVIDE WITH HAND-OFF-AUTOMATIC SELECTOR SWITCH AND INDICATOR LIGHTS.
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE FOUR IN DETAIL:
B	DOORBELL CHIME, WALL MOUNTED.
NOTE:	MOUNT THE FOLLOWING DEVICES AS NOTED:
F	FLUSH VALVE TRANSFORMER POWER CONNECTION. PROVIDE A 4"X4" RECESSED JB AND MOUNT POWER SUPPLY PROVIDED BY DIV 22. COORDINATE CONNECTION WITH DIV 22. PROVIDE A 2"X4" JB AT EACH TOILET, SINK AND WATER CLOSET AS RECOMMENDED BY THE MANUFACTURER. PROVIDE 2 #14 IN 1/2"C "DAISY CHAINED" BETWEEN UP TO EIGHT BOXES AND TERMINATING AT POWER SUPPLY.
V	ISOLATION VALVE. REFER TO ISOLATION VALVE CONTROL DETAIL ON DRAWING E4 SERIES DRAWING.
EC	EQUIPMENT POWER CONNECTION.
J	JUNCTION BOX, CONCEALED ABOVE CEILING, UNO.
J	JUNCTION BOX, WALL MOUNTED. MOUNTING HEIGHT AS INDICATED ON PLANS.
	MOTOR POWER CONNECTION.
S_M	MOTOR RATED SWITCH WITH OVERLOAD PROTECTION.
T	LINE VOLTAGE THERMOSTAT. DIVISION 23 FURNISH, DIVISION 26 INSTALL. REFER TO DIVISION 23 DRAWINGS FOR LOCATIONS AND QUANTITY.
M	POWER FOR DIV 23 MOTORIZED DAMPER. REFER TO DIVISION 23 DRAWINGS FOR LOCATIONS AND QUANTITY.
	NON-METALLIC SURFACE RACEWAY, DEVICES AS INDICATED, MOUNTING HEIGHT INDICATED ON PLANS.
	PANELBOARD OR SWITCHBOARD, PROVIDE 6 INCH CONCRETE HOUSEKEEPING PAD FOR ALL GROUND MOUNTED EQUIPMENT UNLESS NOTED OTHERWISE. DENOTED BY PANELBOARD/SWITCHBOARD TAG PER ONE-LINE DIAGRAM.
	TRANSFORMER, PROVIDE 4 INCH CONCRETE HOUSEKEEPING PAD UNLESS NOTED OTHERWISE. DENOTED BY TRANSFORMER TAG PER ONE-LINE DIAGRAM.
	UTILITY METER. MOUNT PER UTILITY STANDARDS, UNO.
XXX	FEEDER TAG. REFER TO FEEDER SCHEDULE ON DWG E5.1.
	BRANCH CIRCUIT RUN CONCEALED, UNO. DASHED INDICATES CIRCUITRY REQUIRED TO BE RUN BELOW SLAB.
	BRANCH CIRCUIT HOME RUN TO PANELBOARD AND CIRCUIT INDICATED.

RECEPTACLE DEVICE LEGEND

SYMBOL	DESCRIPTION
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE ONE IN DETAIL:
	APPLIANCE RECEPTACLE. PROVIDE NEMA CONFIGURATION TO MATCH PLUG FOR EQUIPMENT SERVED.
	DUPLEX RECEPTACLE, NEMA 5-20R.
	DOUBLE DUPLEX RECEPTACLE, NEMA 5-20R.
	GFCI DUPLEX RECEPTACLE, NEMA 5-20R.
	SINGLE RECEPTACLE, NEMA 5-20R.
	SWITCHED DUPLEX RECEPTACLE WITH SPLIT YOKE. THE BOTTOM OUTLET IS SWITCHED & THE TOP OUTLET IS UNSWITCHED, NEMA 5-15R.
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE TWO IN DETAIL:
	DUPLEX RECEPTACLE, NEMA 5-20R.
	DOUBLE DUPLEX RECEPTACLE, NEMA 5-20R.
	GFCI DUPLEX RECEPTACLE, NEMA 5-20R.
	SINGLE RECEPTACLE, NEMA 5-20R.
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE FOUR IN DETAIL:
	DUPLEX RECEPTACLE, NEMA 5-20R. TV DUPLEX MOUNT AT 60" AFF UNO.
	GFCI DUPLEX RECEPTACLE, NEMA 5-20R.
NOTE:	MOUNT THE FOLLOWING DEVICES AS NOTED:
	DUPLEX RECEPTACLE, NEMA 5-20R, CEILING MOUNT.
	DOUBLE DUPLEX RECEPTACLE, NEMA 5-20R, CEILING MOUNT.
	DUPLEX RECEPTACLE, NEMA 5-20R, RECESS FLOOR MOUNT.
	DOUBLE DUPLEX RECEPTACLE, NEMA 5-20R, RECESS FLOOR MOUNT.
	CORD REEL OUTLET, CEILING MOUNT.

SYMBOL VARIATIONS	DESCRIPTION
	RECEPTACLE CONNECTED TO EMERGENCY POWER, PROVIDE RED DEVICE. TYPE OF RECEPTACLE MAY VARY.
	GFCI RECEPTACLE CONNECTED TO EMERGENCY POWER, PROVIDE RED DEVICE. TYPE OF RECEPTACLE MAY VARY.
	PROTECTIVE COVER FOR RECEPTACLE. PROVIDE NEMA 3R "WHILE IN USE" ENCLOSURE FOR ALL EXTERIOR LOCATIONS. TYPE OF RECEPTACLE MAY VARY.
	PLUG LOAD CONTROLLED RECEPTACLE. TYPE OF RECEPTACLE MAY VARY.
	RECEPTACLE WITH USB PORTS. TYPE OF RECEPTACLE MAY VARY.

FIRE ALARM LEGEND

SYMBOL	DESCRIPTION
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS.
XX	FIRE ALARM AUDIO/VISUAL NOTIFICATION DEVICE. NUMBER INDICATES STROBE CANDELA RATING.
XX	FIRE ALARM VISUAL NOTIFICATION DEVICE. NUMBER INDICATES STROBE CANDELA RATING.
	FIRE ALARM AUDIO NOTIFICATION DEVICE.
XX	FIRE ALARM AUDIO/VISUAL NOTIFICATION DEVICE, CEILING MOUNTED. NUMBER INDICATES STROBE CANDELA RATING.
XX	FIRE ALARM VISUAL NOTIFICATION DEVICE, CEILING MOUNTED. NUMBER INDICATES STROBE CANDELA RATING.
	FIRE ALARM AUDIO NOTIFICATION DEVICE, CEILING MOUNTED.
F	FIRE ALARM MANUAL PULL STATION.
FK	FIRE ALARM KEY OPERATED MANUAL PULL STATION.
CA	CARBON MONOXIDE DETECTOR, CEILING MOUNT.
SCA	COMBINATION SMOKE DETECTOR / CARBON MONOXIDE, CEILING MOUNT.
H	HEAT DETECTOR, CEILING MOUNT.
S	SMOKE DETECTOR, CEILING MOUNT.
SD	FIRE ALARM DUCT SMOKE DETECTOR, FURNISH AND CONNECT UNDER DIVISION 28. INSTALL UNDER DIVISION 23. VERIFY LOCATION WITH DIVISION 23 PRIOR TO ROUGH-IN. PROVIDE ACCESSIBLE KEY OPERATED REMOTE TEST SWITCH FOR EACH DETECTOR.
TS	FIRE ALARM TAMPER SWITCH, PROVIDE UNDER DIVISION 21, FURNISH AND CONNECT MONITOR MODULE TO MONITOR UNDER DIVISION 28.
FS	FIRE ALARM FLOW SWITCH, PROVIDE UNDER DIVISION 21, FURNISH AND CONNECT MONITOR MODULE TO MONITOR UNDER DIVISION 28.
PI	POST INDICATOR VALVE SWITCH, PROVIDE UNDER DIVISION 21, FURNISH AND CONNECT MONITOR MODULE TO MONITOR UNDER DIVISION 28.
PS	FIRE ALARM PRESSURE SWITCH, PROVIDE UNDER DIVISION 21, FURNISH AND CONNECT MONITOR MODULE TO MONITOR UNDER DIVISION 28.
R	FIRE ALARM REMOTE INDICATOR, CEILING MOUNT.
M	FIRE ALARM MONITOR MODULE. NOT ALL MONITOR MODULES ARE INDICATED ON DRAWINGS. PROVIDE QUANTITY AND IN LOCATIONS REQUIRED TO ACCOMPLISH SPECIFIED MONITORING FUNCTIONS.
C	FIRE ALARM CONTROL MODULE. NOT ALL CONTROL MODULES ARE INDICATED ON DRAWINGS. PROVIDE QUANTITY AND IN LOCATIONS REQUIRED TO ACCOMPLISH SPECIFIED CONTROL FUNCTIONS.
B	FIRE ALARM SPRINKLER BELL, MOUNT AT +10'-0"AFF. PROVIDE CONCEALED 120-VOLT POWER CONNECTION
M	FIRE ALARM MAGNETIC DOOR HOLDER, WALL MOUNT. PROVIDE HINGED MAGNETIC CATCH PLATE ON DOOR TO MATE WITH DEVICE. COORDINATE LOCATION AND LENGTH WITH DIVISION 08. PROVIDE CONCEALED 24-VOLT POWER CONNECTION AND FIRE ALARM CONTROL MODULE IF REQUIRED FOR PROPER OPERATION.
M	FIRE ALARM MAGNETIC DOOR HOLDER, FLOOR MOUNT. PROVIDE HINGED MAGNETIC CATCH PLATE ON DOOR TO MATE WITH DEVICE. COORDINATE LOCATION AND LENGTH WITH DIVISION 08. PROVIDE CONCEALED 24-VOLT POWER CONNECTION AND FIRE ALARM CONTROL MODULE IF REQUIRED FOR PROPER OPERATION.
	FIRE ALARM/POWER CONNECTION TO DIVISION 23 SMOKE OR FIRE/SMOKE DAMPER. COORDINATE WITH DIVISION 23. REFER TO TYPICAL FIRE/SMOKE DAMPER DIAGRAM.

SYMBOL VARIATIONS	DESCRIPTION
XX	WIRE GUARD FOR FIRE ALARM NOTIFICATION DEVICE. TYPE OF NOTIFICATION DEVICE MAY VARY.
XX	DEVICE COVER FOR FIRE ALARM NOTIFICATION DEVICE. NUMBER INDICATES STROBE SETTING AND REDUCED EFFECTIVE OUTPUT WHEN DEVICE COVER IS PRESENT. TYPE OF NOTIFICATION DEVICE MAY VARY.
	WIRE GUARD FOR FIRE ALARM INITIATION DEVICE. TYPE OF INITIATION DEVICE MAY VARY.
	SOUNDER BASE FOR FIRE ALARM INITIATION DEVICE. TYPE OF INITIATION DEVICE MAY VARY.
	FIRE ALARM WALL MOUNTED INITIATION DEVICE. TYPE OF INITIATION DEVICE MAY VARY.

POWER / COMMUNICATION DEVICE LEGEND

SYMBOL	DESCRIPTION
#	POWER/COMMUNICATIONS RECESSED FLOOR BOX. WHERE INDICATED, SUBSCRIPT NUMBER INDICATES OUTLET TYPE. REFER TO DETAIL ON E4 SERIES DRAWINGS.
#	POWER/COMMUNICATIONS POKE THRU FLOOR BOX. WHERE INDICATED, SUBSCRIPT NUMBER INDICATES OUTLET TYPE. REFER TO DETAIL ON E4 SERIES DRAWINGS.
SF	SYSTEM FURNITURE FLEX POWER CABLE CONNECTION VIA FLOOR BOX WITH COVER SUITABLE FOR SYSTEM FURNITURE CONNECTION. REFER TO DETAIL ON E4 SERIES DRAWINGS. COORDINATE W/ SYSTEM FURNITURE PROVIDER PRIOR TO ROUGH-IN.
EP	SYSTEM FURNITURE FLEX POWER CABLE CONNECTION VIA FLUSH WALL BOX MOUNTED 8" AFF. REFER TO DETAIL ON E4 SERIES DRAWINGS. COORDINATE W/FURNITURE PROVIDER PRIOR TO ROUGH-IN.
	POWER/COMMUNICATIONS POWER POLE. FURNISHED WITH (NIC) SYSTEM FURNITURE. PROVIDE POWER J-BOX MOUNTED TO STRUCTURE ABOVE CEILING, AND FLEXIBLE CONDUIT CONNECTION TO J-BOX MOUNTED TO TOP OF POLE AND CONNECTED TO PIGTAIL(S) FURNISHED WITH POLE. POLE LOCATION IS APPROXIMATE, COORDINATE WITH SYSTEM FURNITURE PROVIDER PRIOR TO ROUGH-IN.

SYMBOL VARIATIONS	DESCRIPTION
	POWER/COMMUNICATIONS RECESSED FLOOR BOX OR POKE THRU CONNECTED TO EMERGENCY POWER, PROVIDE RED DEVICES.

ONE LINE DIAGRAM LEGEND

SYMBOL	DESCRIPTION
	CIRCUIT BREAKER
	FUSED SWITCH
	TRANSFORMER
	TRANSFER SWITCH
XXX	FEEDER DESIGNATION
CT	CURRENT TRANSFORMER
PT	POTENTIAL TRANSFORMER

LIGHTING LEGEND

SYMBOL	DESCRIPTION
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS.
S	LIGHT SWITCH, RATED 120/277 VOLTS, 20-AMPS.
S_S	LIGHT SWITCHES WIRED FOR INBOARD/OUTBOARD SWITCHING, RATED 120/277 VOLTS, 20-AMPS.

SUBSCRIPT/SUPERSCRIPT LETTERS, NUMBERS, AND SYMBOLS INDICATES SWITCH TYPE AS FOLLOWS:

3	INDICATES 3-WAY LIGHT SWITCH
4	INDICATES 4-WAY LIGHT SWITCH
D	INDICATES DIMMER SWITCH
D3	INDICATES 3-WAY DIMMER LIGHT SWITCH
D4	INDICATES 4-WAY DIMMER LIGHT SWITCH
K	INDICATES KEY OPERATED LIGHT SWITCH
K3	INDICATES KEY OPERATED 3-WAY LIGHT SWITCH
K4	INDICATES KEY OPERATED 4-WAY LIGHT SWITCH
LV	INDICATES LOW VOLTAGE LIGHT SWITCH
OS	INDICATES SWITCH WITH INTEGRAL OCCUPANCY SENSOR
OD	INDICATES DIMMER SWITCH WITH INTEGRAL OCCUPANCY SENSOR
P	INDICATES PILOT LIGHT, ON WHEN SWITCH IS ON
T	INDICATES TIMER LIGHT SWITCH
VS	INDICATES SWITCH WITH INTEGRAL VACANCY SENSOR
VD	INDICATES DIMMER SWITCH WITH INTEGRAL VACANCY SENSOR

LOWER CASE LETTER INDICATES LIGHT FIXTURE CONTROL DESIGNATION

	OMNI-DIRECTIONAL LIGHTING CONTROL OCCUPANCY DETECTOR, CEILING MOUNT.
	DIRECTIONAL LIGHTING CONTROL OCCUPANCY DETECTOR, WALL MOUNT AT 6" BELOW FINISHED CEILING.
	OMNI-DIRECTIONAL LIGHTING CONTROL VACANCY DETECTOR, CEILING MOUNT.
	DIRECTIONAL LIGHTING CONTROL VACANCY DETECTOR, WALL MOUNT AT 6" BELOW FINISHED CEILING.
PS	PHOTOCELL SENSOR FOR LIGHTING CONTROL. WALL MOUNT AT +10'-0"AFF. AIM NORTH.
DS	DAYLIGHT HARVESTING SENSOR FOR LIGHTING CONTROL, CEILING MOUNT.
GR	GENERATOR RELAY DEVICE.
	LIGHT FIXTURE, CEILING MOUNT.
	LIGHT FIXTURE ON EMERGENCY POWER, CEILING MOUNT.
	LIGHT FIXTURE, WALL MOUNT, HEIGHT AS INDICATED.
	LIGHT FIXTURE ON EMERGENCY POWER, WALL MOUNT, HEIGHT AS INDICATED.
	EXIT SIGN, CEILING MOUNT. DIRECTIONAL ARROWS AS INDICATED. SHADING INDICATES FACE(S) OF SIGN.
	EXIT SIGN, WALL MOUNT. DIRECTIONAL ARROWS AS INDICATED. SHADING INDICATES FACE(S) OF SIGN.
	TRACK LIGHTS.
	LIGHT FIXTURE, POLE MOUNT.
	CEILING FAN WITH LIGHTING FIXTURE.

COMMUNICATIONS LEGEND

SYMBOL	DESCRIPTION
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE ONE IN DETAIL:
$\blacktriangledown_X$	TELECOMMUNICATIONS OUTLET, WHERE INDICATED, SUBSCRIPT NUMBER INDICATES OUTLET TYPE. REFER TO DETAIL ON E4 SERIES DRAWINGS.
M	MICROPHONE OUTLET. WALL MOUNT AT +1'-6" AAF. SUBSCRIPT NUMBER INDICATES NUMBER OF JACKS TO PROVIDE IN OUTLET.
M	MICROPHONE, CEILING MOUNT, W/ PENDANT. SUBSCRIPT NUMBER INDICATES NUMBER OF JACKS TO PROVIDE IN OUTLET.
A	AUDIO INPUT OUTLET.
V	VIDEO INPUT OUTLET.
SBB	TELECOMMUNICATIONS SECONDARY BONDING BUS BAR.
PBB	TELECOMMUNICATIONS PRIMARY BONDING BUS BAR.
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE TWO IN DETAIL:
$\blacktriangledown_X$	TELECOMMUNICATIONS OUTLET, WHERE INDICATED, SUBSCRIPT NUMBER INDICATES OUTLET TYPE. REFER TO DETAIL ON E4 SERIES DRAWINGS.
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE THREE IN DETAIL:
	INTERCOM STATION WITH PUSHBUTTON.
	MASTER INTERCOM STATION.
	PUSHBUTTON SWITCH.
NOTE:	REFER TO 'TYPICAL DEVICE ELEVATION DETAIL' FOR DEVICE MOUNTING REQUIREMENTS. FOLLOWING DEVICES ARE DENOTED AS KEYNOTE FOUR IN DETAIL:
	WALL CLOCK. ARROW(S) INDICATE FACE(S) DIRECTION.
S	SOUND SYSTEM SPEAKER, RECESS WALL MOUNT.
NOTE:	MOUNT THE FOLLOWING DEVICES AS NOTED:
	MISC COMMUNICATIONS OUTLET. REFER TO DETAIL ON E4 SERIES DRAWINGS.
	RECESSED FLOOR MOUNT DEVICE COMPLETE WITH FITTINGS FOR FLOOR COVERING. REFER TO DETAIL ON E4 SERIES DRAWINGS.
	RECESSED FLOOR MOUNT DEVICE COMPLETE WITH FITTINGS FOR FLOOR COVERING. REFER TO DETAIL ON E4 SERIES DRAWINGS.
	CATV OUTLET, COORDINATE MOUNTING HEIGHTS WITH ARCHITECTURAL DRAWINGS.
	MISC CATV OUTLET, COORDINATE MOUNTING HEIGHTS WITH ARCHITECTURAL DRAWINGS.
	WALL CLOCK, CEILING MOUNT. ARROW(S) INDICATE FACE(S) DIRECTION.
S	SOUND SYSTEM SPEAKER, RECESS CEILING MOUNT.
W	WIRELESS ACCESS POINT.
	2 POST TELECOMMUNICATIONS EQUIPMENT RACK.
	4 POST TELECOMMUNICATIONS EQUIPMENT RACK.
	2" EMT CONDUIT SLEEVE WITH NYLON BUSHING EACH END UNO, THRU WALL AT +6" ABOVE FINISHED CEILING.
	CABLE TRAY, MOUNT AT +6" ABOVE FINISHED CEILING.

SYMBOL VARIATIONS	DESCRIPTION
S S	SOUND SYSTEM SPEAKER WITH WIRE GUARD.
S	WEATHERPROOF SOUND SYSTEM SPEAKER.

GENERAL NOTES

A. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND WHAT IS REQUIRED BY ONE SHALL BE AS BINDING AS IF REQUIRED BY ALL. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE BETTER QUALITY. IN THE CASE OF A CONFLICT, DISAGREEMENT, OR AMBIGUITY, PROVIDE THE GREATER QUANTITY OF WORK.

B. FOLLOW MOUNTING HEIGHTS INDICATED IN THE ELECTRICAL LEGEND UNLESS OTHERWISE INDICATED, INCLUDING ON ARCHITECTURAL ELEVATIONS. MEASURE ALL MOUNTING HEIGHTS FROM THE DEVICE CENTER LINE UNLESS OTHERWISE INDICATED.

C. FIELD VERIFY EXACT FEEDER LOCATIONS FOR MECHANICAL EQUIPMENT PRIOR TO ROUGH-IN.

D. EQUIPMENT CONNECTIONS ARE INDICATED IN THEIR APPROXIMATE LOCATIONS. VERIFY EXACT LOCATIONS OF ALL CONNECTIONS WITH OTHER TRADES SUPPLYING EQUIPMENT TO AVOID CONFLICTS AT INSTALLATION.

E. LOCATED ALL SWITCHES FOR LOCAL CONTROL OF LIGHTING ON STRIKE SIDE OF SINGLE DOORS UNLESS OTHERWISE INDICATED.

F. PROVIDE SPECIFIC BREAKER ARRANGEMENT FOR THE PANEL BOARDS WHEREVER PHYSICALLY POSSIBLE. PROVIDE AS-BUILT DRAWINGS INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT. PROVIDE TYPE WRITTEN PANELBOARD DIRECTORIES INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT.

G. PROVIDE AS-BUILT DRAWINGS INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT. PROVIDE TYPEWRITTEN PANELBOARD DIRECTORIES INDICATING ACTUAL BRANCH CIRCUIT ARRANGEMENT. HAND WRITTEN SCHEDULES ARE NOT ACCEPTABLE.

H. ALL CONDUIT RUNS INDICATED ARE DIAGRAMMATIC, COORDINATE ROUTING IN ALL SPACES WITH OTHER TRADES.

I. ALL PANELBOARDS INDICATED ARE HOUSED IN A SINGLE WIDTH ENCLOSURE, UNO. THE CONTRACTOR SHALL FIELD VERIFY ROOM LAYOUT AND ADJUST ACCORDINGLY, AT NO COST TO THE OWNER, IF PROVIDING ANY PANELBOARD ENCLOSURES.

J. WHERE POWER AND COMMUNICATION OUTLETS ARE INDICATED IN CLOSE PROXIMITY ON THE DRAWINGS, FIELD COORDINATE THE LOCATIONS TO PLACE THE OUTLETS ADJACENT TO EACH OTHER.

K. ALL EXTERIOR RECEPTACLES SHALL BE LABELED "WR" - WEATHER RESISTANT.

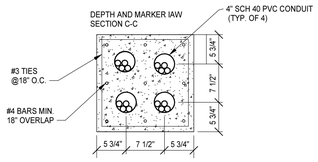
L. WHEN GROUPING MULTIPLE LINE TO NEUTRAL BRANCH CIRCUITS IN A CONDUIT, PROVIDE DEDICATED COLOR CODED NEUTRAL CONDUCTORS FOR EACH CIRCUIT. DO NOT USE BREAKER TIES AND SHARED NEUTRALS EVEN THOUGH PERMITTED BY NEC.

M. PROVIDE A 2" WIDE YELLOW LINE PAINTED ON THE FLOOR INDICATING THE ELECTRICAL WORKING SPACE. IN FRONT OF ALL ELECTRICAL PANELS IN ELECTRICAL ROOMS. REFER TO PLANS FOR ELECTRICAL WORKING SPACE DETAILS. STENCIL "NO STORAGE" IN 2" HIGH, YELLOW LETTERS CENTERED IN THE OUTLINED AREA.

N. REFER TO STRUCTURAL DRAWINGS FOR ALL CONDUIT REQUIREMENTS BEING PLACED IN CMU WALLS.

ABBREVIATIONS

1P	SINGLE PHASE
3P	THREE PHASE
3R	WEATHERPROOF (NEMA 3R)
A	AMPS
AFF	ABOVE FINISHED FLOOR
AL	ALUMINUM
ATS	AUTOMATIC TRANSFER SWITCH
BFC	BELOW FINISHED CEILING
BFG	BELOW FINISHED GRADE
BKR	BREAKER
C	CONDUIT
CATV	COMMUNITY ANTENNA TELEVISION (CABLE)
CB	CIRCUIT BREAKER
CBL	CABLE
CCTV	CLOSED CIRCUIT TELEVISION
CKT	CIRCUIT
CLG	CEILING
CLR	CLEAR
CO.	COMPANY
COMB	COMBINATION
COMM	COMMUNICATIONS
CU	COPPER
DIA	DIAMETER
DISC	DISCONNECT
DIV	DIVISION
DWG	DRAWING
EBH	ELECTRIC BASEBOARD HEATER
EC	EMPTY CONDUIT
ECS	EMERGENCY COMMUNICATIONS STATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
EPO	EMERGENCY POWER OFF
EQ	EQUIPMENT
ETR	EXISTING TO REMAIN
EWC	ELECTRIC WATER COOLER
EX	EXISTING
EXT	EXTERIOR
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FAGP	FIRE ALARM GRAPHIC PANEL
FAXP	FIRE ALARM EXTENDER PANEL
FFSCP	FIRE FIGHTER'S SMOKE CONTROL PANEL
FLA	FULL LOAD AMPS
FPMR	FUSE PER MANUFACTURERS REQUIREMENTS/RECOMMENDATIONS
FPND	FUSE PER NAMEPLATE DATA
G	GROUND
GE	GROUND FAULT PROTECTION FOR EQUIPMENT, 6-50mA PER NEC 427.22 (PROVIDE ACCESSORY FOR INDICATED BREAKER)
GFCI	GROUND FAULT CIRCUIT INTERRUPT
GFP	GROUND FAULT PROTECTION FOR PERSONNEL 4-6mA (PROVIDE ACCESSORY FOR INDICATED BREAKER)
HKP	HOUSEKEEPING PAD
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
Hz	HERTZ
IAW	IN ACCORDANCE WITH
IG	ISOLATED GROUND
J-BOX	JUNCTION BOX
KHFSS	KITCHEN HOOD FIRE SUPPRESSION SYSTEM
KHz	KILOHERTZ
KVA	KILOVOLT AMPS
KW	KILOWATTS
KWH	KILOWATT HOURS
L	LOCKOUT TO PREVENT UNAUTHORIZED SWITCHING (PROVIDE ACCESSORY FOR INDICATED BREAKER)
LC	ROUTE CIRCUIT TO LOAD VIA LIGHTING CONTACTOR; REFER TO LC SCHEDULE
LED	LIGHT EMITTING DIODE
LTG	LIGHTING
LTS	LIGHTS
MAX	MAXIMUM
MCA	MINIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MH	METAL HALIDE
MHz	MEGAHERTZ
MIN	MINIMUM
ML	MAINTENANCE LOCK (PROVIDE ACCESSORY FOR INDICATED BREAKER)
MLO	MAIN LUG ONLY
MNS	MASS NOTIFICATION SYSTEM
MOCP	MAXIMUM OVER CURRENT PROTECTION.
MTD	MOUNTED
N	NEUTRAL
N/C	NORMALLY CLOSED
N/O	NORMALLY OPEN
NO.	NUMBER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
P	PILOT LIGHT (AT THE SWITCH HANDLE)
PBD	PANELBOARD
PD	PROTECTIVE DEVICE
RCPT	RECEPTACLE
REC	RECEPTACLE
SEC	SECURITY
SPD	SURGE PROTECTIVE DEVICE
SPEC.	SPECIFICATION(S)
ST	SHUNT TRIP, 120V COIL (PROVIDE ACCESSORY FOR INDICATED BREAKER)
SW	SWITCH
SWBD	SWITCHBOARD
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TC	TELECOMMUNICATIONS CLOSET
TELECOM	TELECOMMUNICATIONS
TGB	TELECOMMUNICATIONS GROUNDING BUS BAR
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUS BAR
TYP	TYPICAL
UNO	UNLESS NOTED (INDICATED) OTHERWISE
V	VOLTS
VFD	VARIABLE FREQUENCY DRIVE
VIF	VERIFY IN FIELD
W	WATTS
W/	WITH
WG	WIRE GUARD
WP	WEAT



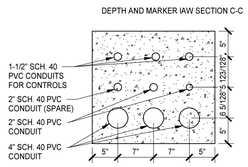
UNDER ROADWAYS/DRIVES WITH VEHICULAR TRAFFIC:
PROVIDE 3000 PSI CONCRETE UNDER ROADWAYS AND DRIVEWAYS WITH VEHICULAR TRAFFIC.
PROVIDE CONDUIT SPACERS EVERY 6'-0"

ELSEWHERE:
PROVIDE #10 SCREENINGS OR APPROVED ENGINEERED FILL THROUGHOUT
PROVIDE CONDUIT SPACERS EVERY 6'-0"

UTILITY XFMR TO SWITCHBOARD MDP

DUCTBANK SECTION A-A

NO SCALE



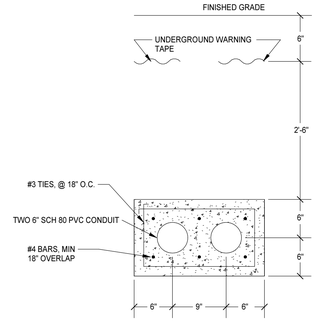
UNDER ROADWAYS/DRIVES WITH VEHICULAR TRAFFIC:
PROVIDE 3000 PSI CONCRETE UNDER ROADWAYS AND DRIVEWAYS WITH VEHICULAR TRAFFIC.
PROVIDE CONDUIT SPACERS EVERY 6'-0"

ELSEWHERE:
PROVIDE #10 SCREENINGS OR APPROVED ENGINEERED FILL THROUGHOUT
PROVIDE CONDUIT SPACERS EVERY 6'-0"

GENERATOR TO ELEC. ROOM

DUCTBANK SECTION B-B

NO SCALE



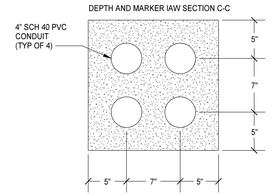
UNDER ROADWAYS/DRIVES WITH VEHICULAR TRAFFIC:
PROVIDE 3000 PSI CONCRETE UNDER ROADWAYS AND DRIVEWAYS WITH VEHICULAR TRAFFIC.
PROVIDE CONDUIT SPACERS EVERY 6'-0"

ELSEWHERE:
PROVIDE #10 SCREENINGS OR APPROVED ENGINEERED FILL THROUGHOUT
PROVIDE CONDUIT SPACERS EVERY 6'-0"
PROVIDE NYLON PULL CORD IN EACH CONDUIT.

TO UTILITY XFMR FOR UTILITY PRIMARY

DUCTBANK SECTION C -C

NO SCALE



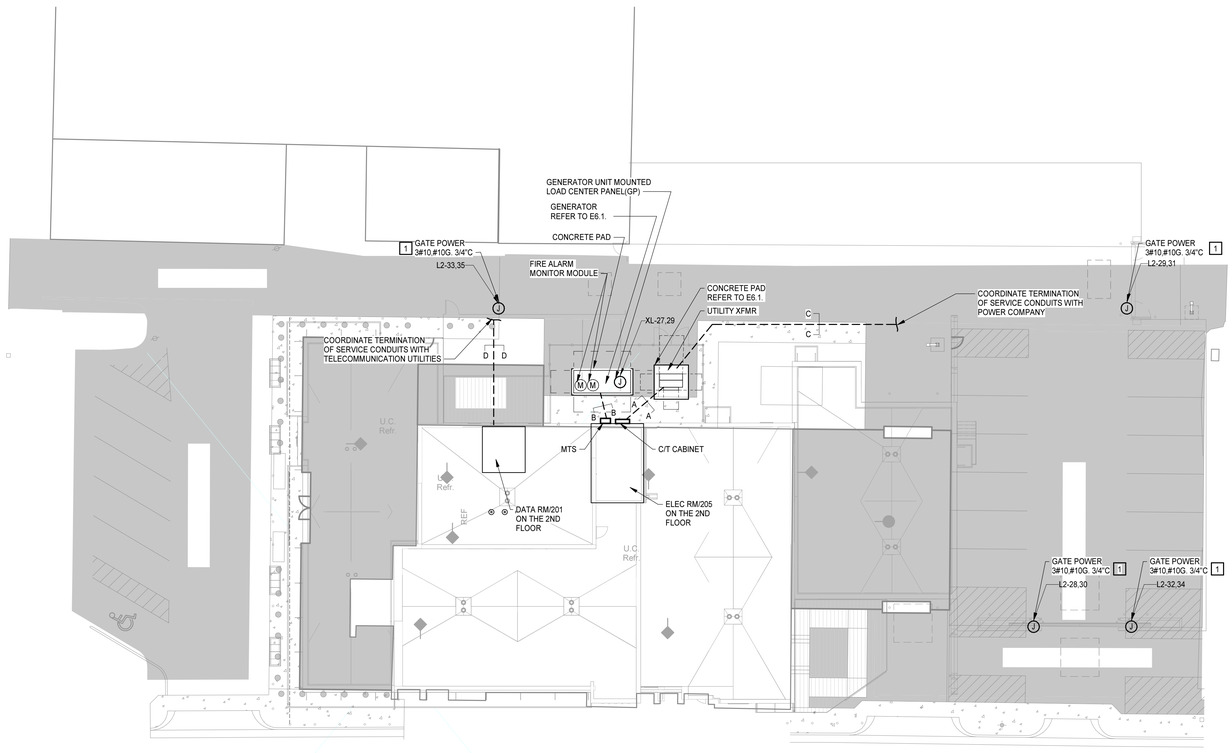
#10 SCREENINGS OR APPROVED ENGINEERED FILL THROUGHOUT
PROVIDE CONDUIT SPACERS EVERY 6'-0"

CONTRACTOR'S OPTION TO USE CONCRETE IN LIEU OF SAND.
PROVIDE NYLON PULL CORD IN EACH CONDUIT.

COMMUNICATION UTILITIES VIA PULL BOXES TO MDF ROOM

DUCTBANK SECTION D-D

NO SCALE



SITE PLAN - ELECTRICAL

1/16" = 1'-0"

GENERAL NOTES

A. COORDINATE WITH CIVIL DRAWINGS FOR ALL SITE WORK INCLUDING UTILITY TRANSFORMER AND GENERATOR LOCATION .

B. COORDINATE WITH CIVIL PLANS FOR ALL EXACT DUCTBANK ROUTINGS.

C. ELECTRICAL CONTRACTOR SHALL ROUTE ELECTRICAL CONDUITS TO AVOID CONFLICTS WITH SITE UTILITIES AND MAINTAIN REQUIRED EASEMENTS.

KEYNOTES

APPLIES TO DRAWINGS E0.2.1
REPRESENTED BY n

1. COORDINATE WITH CIVIL PLANS FOR ADDITIONAL GATE INFORMATION.

Moseley
3200 NORFOLK STREET. RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
BRIAN C. WELLS
Lic. No. 046269
10-21-26
PROFESSIONAL ENGINEER

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS
DATE DESCRIPTION

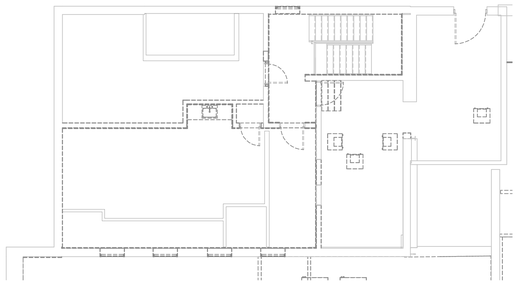
ELECTRICAL SITE PLAN

E0.2.1

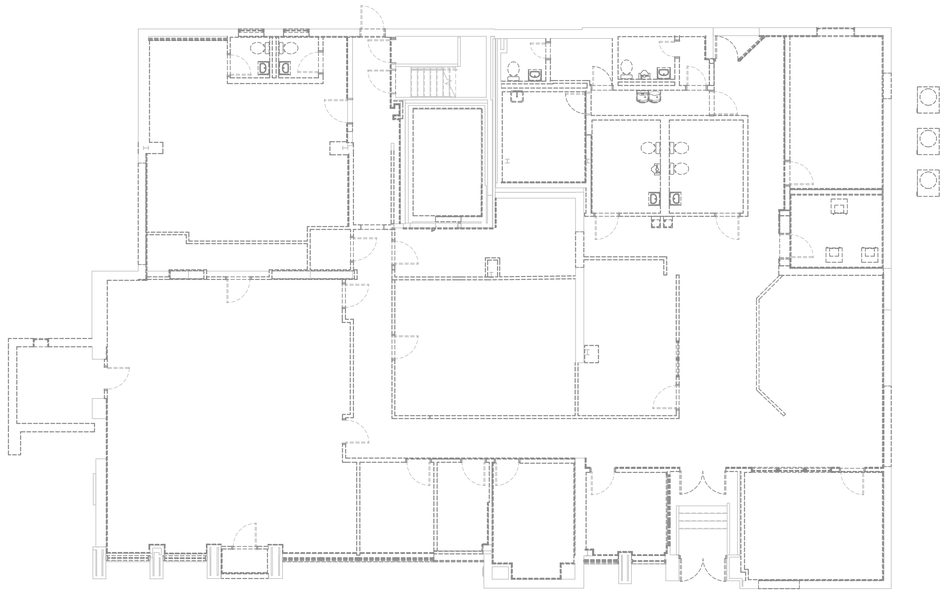
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GENERAL NOTES

A. ALL EXISTING ELECTRICAL, FIRE ALARM, LOW VOLTAGE AND LIGHTING DEVICES, FIXTURES AND EQUIPMENT TO BE DEMOLISHED.



SECOND FLOOR PLAN - ELEC DEMOLITION
1/8" = 1'-0"



FIRST FL0OR PLAN - ELEC DEMOLITION
1/8" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
BRIAN C. WELLS
Lic. No. 046269
10-21-26
PROFESSIONAL ENGINEER

N

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

ELECTRICAL DEMOLITION PLANS

E0.3.1

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LIGHT FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER	SERIES NO.	WATTAGE	MOUNTING TYPE	LIGHT SOURCE	LUMENS	CCT	CRI	COMMENTS
A	2X4 RECESSED PLENUM RATED TROFFER	HE WILLIAMS	PT-24-L61/935-RA-DIM-UNV	45.5	RECESSED	LED	6000	3500K	90	
B	2X2 RECESSED PLENUM RATED TROFFER	HE WILLIAMS	PT-22-L52/935-RA-DIM-UNV	41.6	RECESSED	LED	5000	3500K	90	
C	6" CAN PLENUM RATED LIGHT	HE WILLIAMS	6PR-TL-L30-935-DIM-UNV-OW-OF-CS	23.9	Ceiling	LED	2900	3500K	90	
CW	6" CAN PLENUM RATED LIGHT WET LOCATION	HE WILLIAMS	6PR-TL-L30-935-DIM-UNV-OW-OF-CS-WET/CC	23.9	Ceiling	LED	2900	3500K	90	
D	4" CAN PLENUM RATED LIGHT	HE WILLIAMS	4PR-TL-L20-935-DIM-UNV-OW-OF-CS	20.9	Ceiling	LED	2000	3500K	90	
F	2' VANITY LIGHT	MATTEO	S09226CH	24	WALL MOUNTED	LED	2400	3000K	90	CENTER ABOVE MIRROR
G	4FT LINEAR PENDANT	HE WILLIAMS	96-4-L40-935-HAFR-DIM-UNV	30	SUSPENDED	LED	4000	3500K	90	SUSPEND 12' AFF UNO
H	EXTERIOR 4" CAN LIGHT WET LOCATION	GOTHAM LIGHTING	IVO4S-D-10LM-40K-80CRI-WD-MIN10-MVOLT-ZT-ICAT-WL-P-BZR-LS-F	10.5	Ceiling	LED	1060	4000K	80	SHALLOW PLENUM
H2	SHALLOW PLENUM 4" EXTERIOR CAN LIGHT	GOTHAM LIGHTING	IVO4S-D-10LM-40K-80CRI-WD-MIN10-MVOLT-ZT-ICAT-WL-P-BZR-LS-F	10.5	Ceiling	LED	1060	4000K	80	SHALLOW PLENUM
K1	LAYERED PENDANT DOWNLIGHT	VISUAL COMFORT & CO	TOB-5158PN-WG	60	SUSPENDED	LED	1500	3500K	90	
S	2X4 SURFACE SECURITY TROFFER	KENALL	SCD-4-4-67L35K-4-6-1-DV	75	SURFACE	LED	8300	3500K	90	
V	POLICE WALL SCONCE	SENTRY ELECTRIC	SPRT-12-INC-MED-WH-POLICE-BK-BK	15	WALL MOUNTED	LED	700	4000K	80	MOUNT 8' AFF
W	EXTERIOR WALL PACK	HE WILLIAMS	VWPH-L30-840-T3-DB2-CGL-DIM-UNV	27	WALL MOUNTED	LED	3500	4000K	90	
X1C	CLG MOUNTED EXIT SIGN SINGLE FACE	HE WILLIAMS	EXIT/EL-SF-G-UNV	3	SURFACE MOUNTED	LED				
X1W	REAR MOUNTED EXIT SIGN	HE WILLIAMS	EXIT/EL-SF-G-UNV	3	WALL MOUNTED	LED				
X2C	CLG MOUNTED EXIT SIGN DOUBLE FACE	HE WILLIAMS	EXIT/EL-DF-G-UNV	3	SURFACE MOUNTED	LED				

GENERAL NOTES:

A. ALL FIXTURES SHALL BE CAPABLE OF 120V AND 277V INPUT (MVOLT), UNO.
B. KITCHEN FIXTURES: INSTALL LENS WITH SMOOTH SIDE OUT.
C. ALL LENS SHALL BE A MINIMUM 0.125" THICKNESS, UNO.
D. PROVIDE NUMBER OF FACES AND DIRECTIONAL CHEVRONS FOR EXIT SIGNS AS INDICATED ON DWGS.

GENERAL NOTES

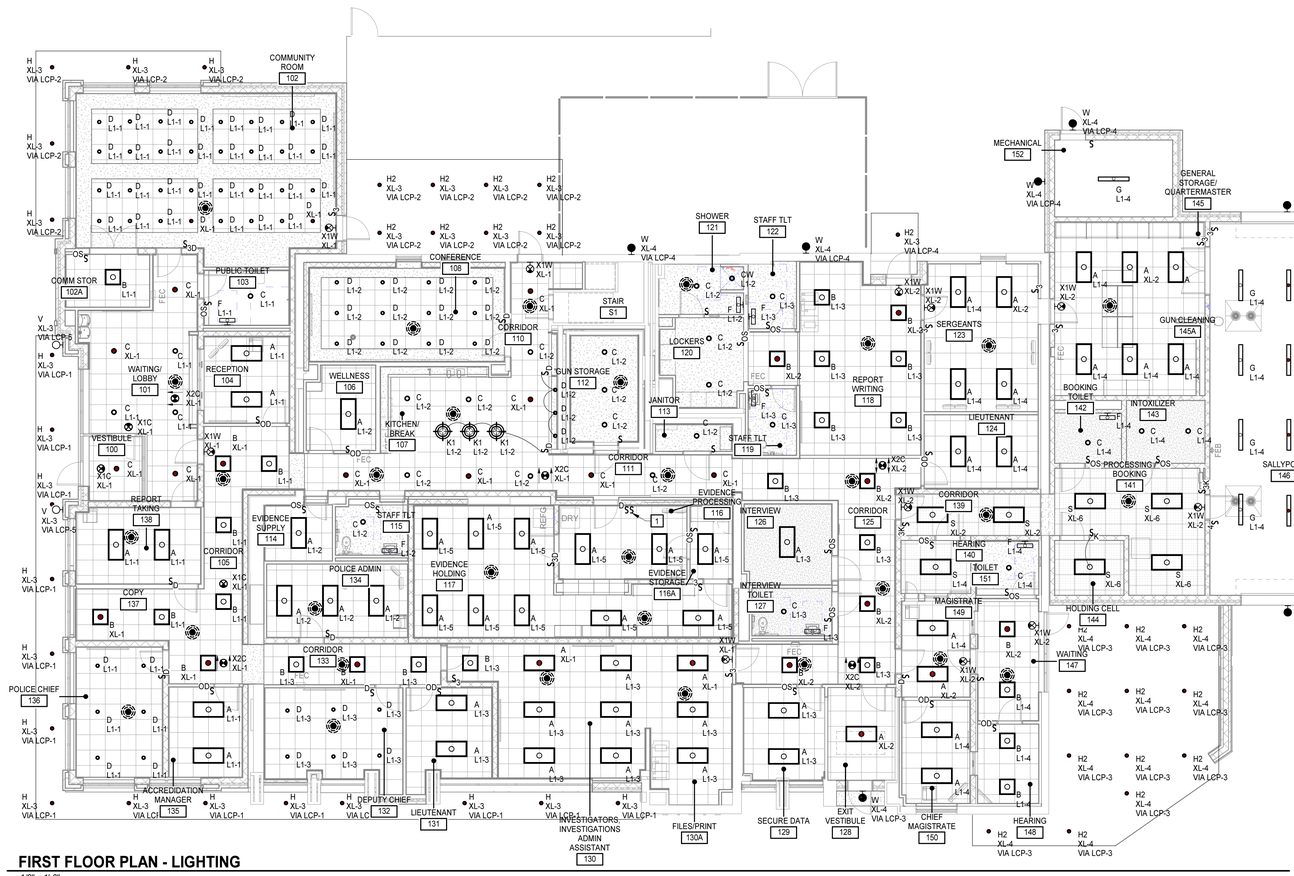
A. ALL INTERIOR EMERGENCY EGRESS LIGHTING, AND EXIT SIGNS SHALL BE UNSWITCHED AND REMAIN ON CONTINUOUSLY.

KEYNOTES

APPLIES TO DRAWINGS E1.1.1
REPRESENTED BY n

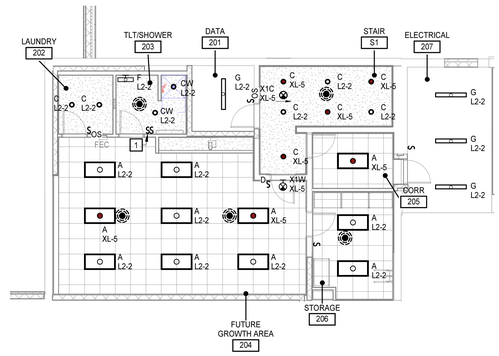
1. PROVIDE A LIGHTING SWITCH TO CONTROL CEILING FAN WHICH IS ALSO CONTROLLED BY CEILING OCCUPANCY SENSOR. REFER TO E2.1.4 FOR ADDITIONAL INFORMATION.

2. DOWNLIGHTS TO BE CENTERED ABOVE GLASS SHELVING CABINET, REFER TO INTERIOR SHEETS FOR MORE INFORMATION. COORDINATE IN FIELD.



FIRST FLOOR PLAN - LIGHTING

1/8" = 1'-0"



SECOND FLOOR PLAN - LIGHTING

1/8" = 1'-0"

Moseley
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COMMONWEALTH OF VIRGINIA
BRIAN C. WELLS
Lic. No. 046269
10-21-26
PROFESSIONAL ENGINEER

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

FLOOR PLANS - LIGHTING

E1.1.1

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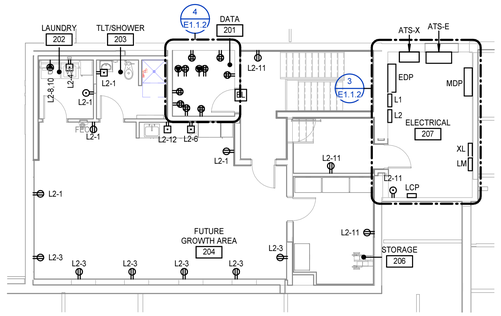
GENERAL NOTES

A. REFER TO ARCHITECTURAL OR INTERIOR PLANS FOR ADDITIONAL INFORMATION INCLUDING LOCATIONS AND HEIGHTS OF OUTLETS & JUNCTION BOXES.

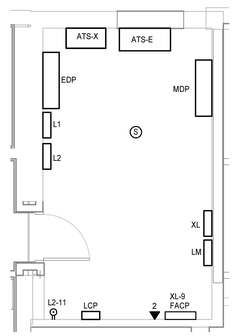
KEYNOTES

APPLIES TO DRAWINGS 1.1.2
REPRESENTED BY n

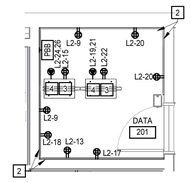
1. CONTRACTOR INSTALLED UTILITY CO. KWH METER. PROVIDE 1-1/4" RGS CONCEALED CONDUIT FROM CT COMPARTMENT FOR UTILITY WIRING. FINAL LOCATION OF KWH METER SHALL BE DETERMINED BY POWER UTILITY COMPANY.
2. PROVIDE 4'X8'X3/4" FIRE RATED PLYWOOD. PAINT WHITE.
3. MOUNT DEVICE TO EQUIPMENT RACK AT 1'-6" AFF. DO NOT OBSTRUCT RACK SPACE. ROUTE FLEXIBLE METALLIC CABLE STRAPPED TO RACK UP TO JUNCTION BOX ABOVE CEILING FOR HOMERUN IN EMT CONDUIT.
4. RECEPTACLE SHALL BE L6-30R VIA 2#10,#10,3/4"C.
5. MOUNT RECEPTACLE HORIZONTALLY AT 3' 4" TO CENTER.



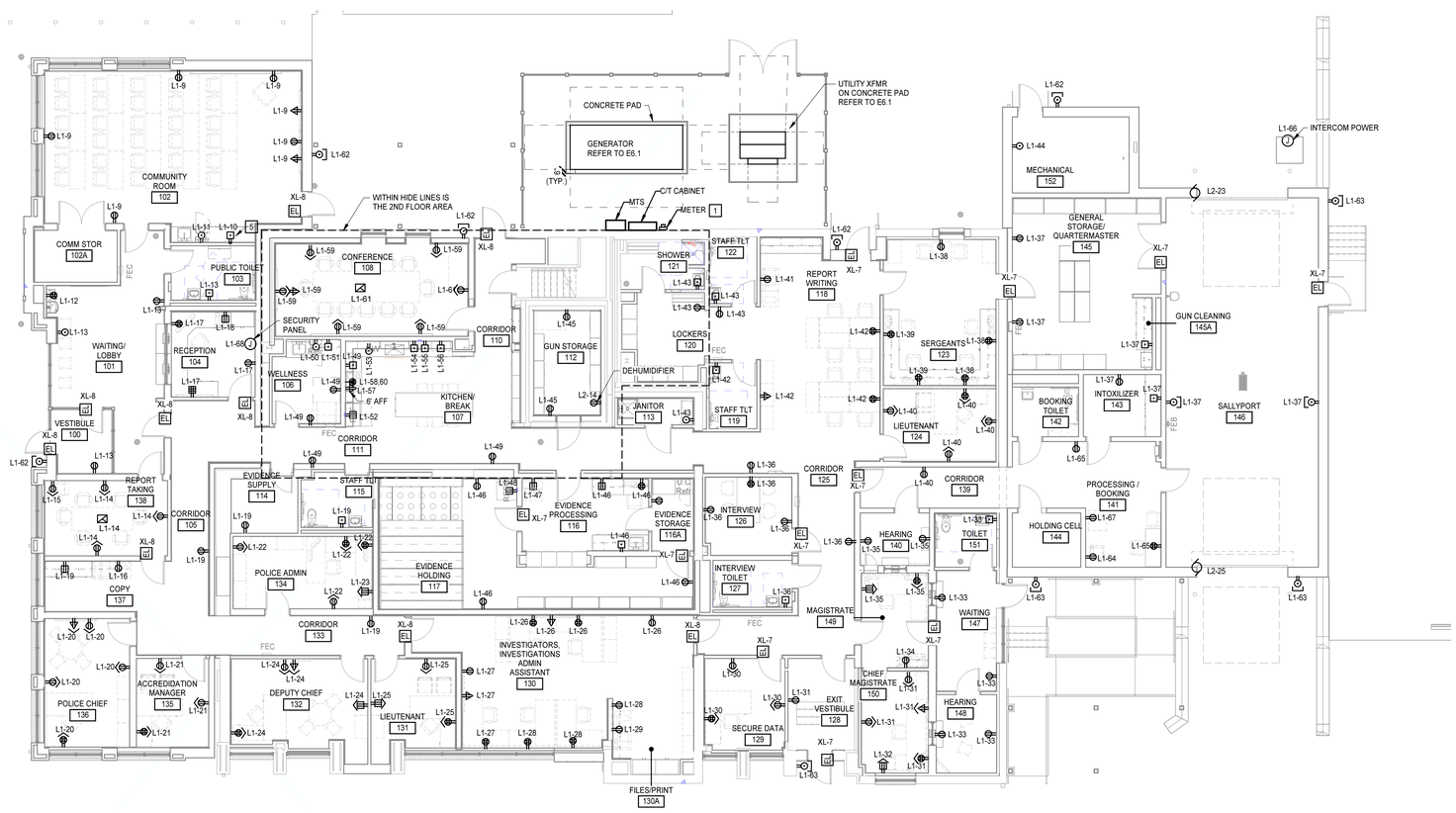
2 SECOND FLOOR - POWER
E1.1.2 — 1/8" = 1'-0"



3 ENLARGED PLAN - ELEC/205
E1.1.2 E1.1.2 — 1/4" = 1'-0"



4 ENLARGED PLAN - DATA/201
E1.1.2 E1.1.2 — 1/4" = 1'-0"



FIRST FLOOR PLAN - POWER
1/8" = 1'-0"

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PHONE (804) 794-7555
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Lic. No. 046269
10-21-26
PROFESSIONAL ENGINEER

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FLOOR PLANS - POWER

E1.1.2

10/21/2026 11:18:07 AM

GENERAL NOTES

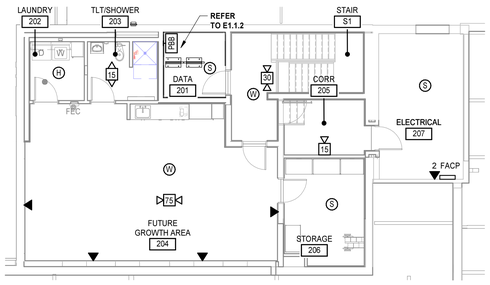
A. REFER TO ARCHITECTURAL OR INTERIOR PLANS FOR ADDITIONAL INFORMATION INCLUDING LOCATIONS AND HEIGHTS OF OUTLETS & JUNCTION BOXES.

B. PROVIDE CONDUITS/JUNCTION BOXES FOR TELE/DATA/WIFI/TV SYSTEM ALL DEVICES/ EQUIPMENT AND CABLES FOR THE SYSTEM SHALL BE PROVIDED BY OWNER.

KEYNOTES

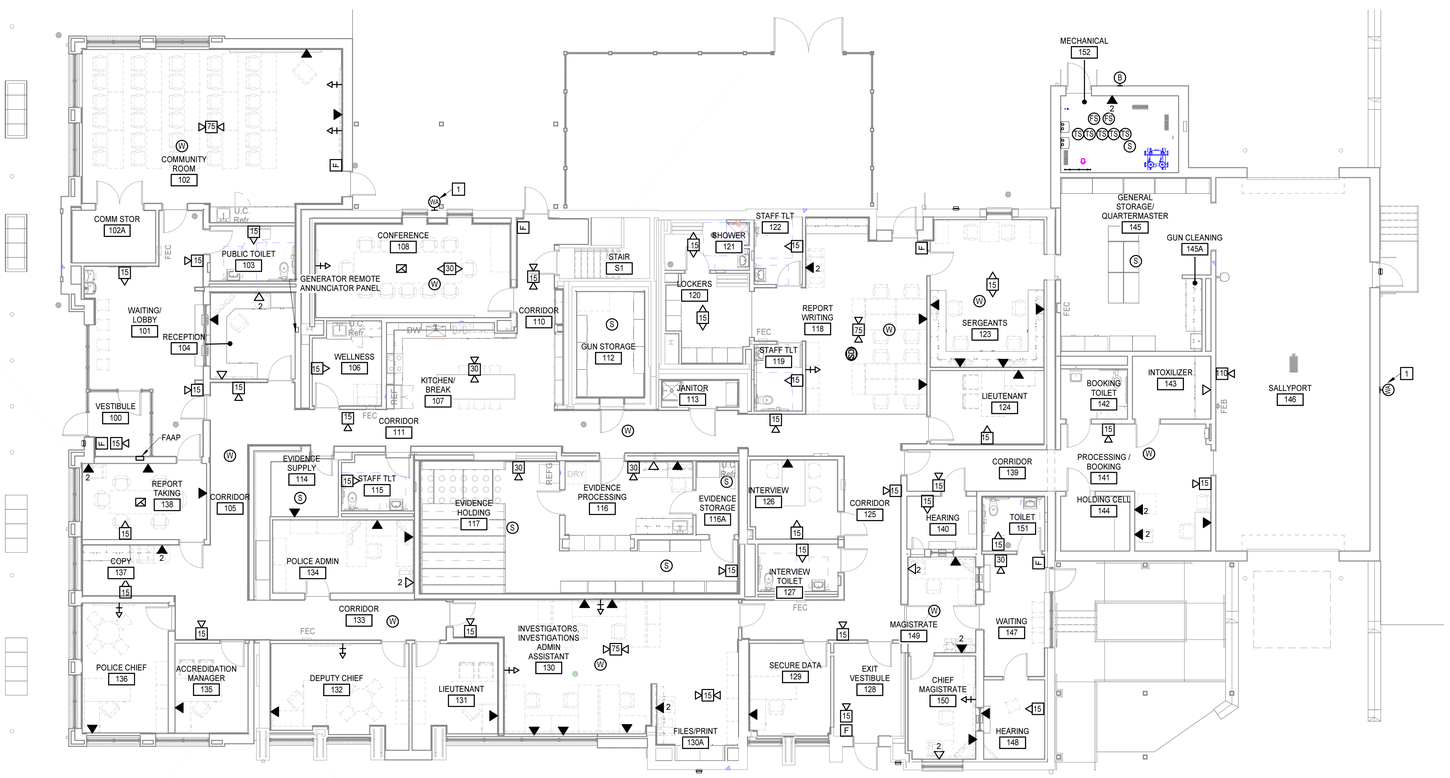
APPLIES TO DRAWINGS E1.1.3
REPRESENTED BY [n]

1. MOUNT WIRELESS ACCESS POINT 9' AFF.



SECOND FLOOR PLAN - COMMUNICATIONS

1/8" = 1'-0"



FIRST FLOOR PLAN - COMMUNICATIONS

1/8" = 1'-0"

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Lic. No. 046269
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PROFESSIONAL ENGINEER

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DATE	DESCRIPTION

FLOOR PLANS - COMMUNICATIONS

E1.1.3

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GENERAL NOTES

A. COORDINATE LOCATION OF ALL DISCONNECTS, CONTROL PANELS, & ELECTRICAL CONNECTIONS WITH MECHANICAL

KEYNOTES

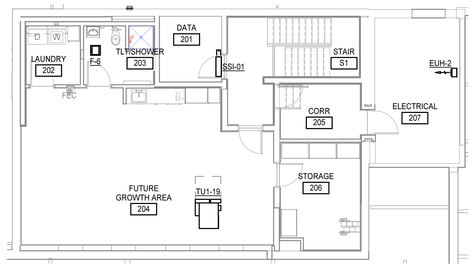
APPLIES TO DRAWINGS E1.1.4
REPRESENTED BY n

1. REFER TO E5.1 FOR ADDITIONAL INFORMATION.

DIV 22, 23 ELECTRICAL CONNECTION SCHEDULE - E1.1.4

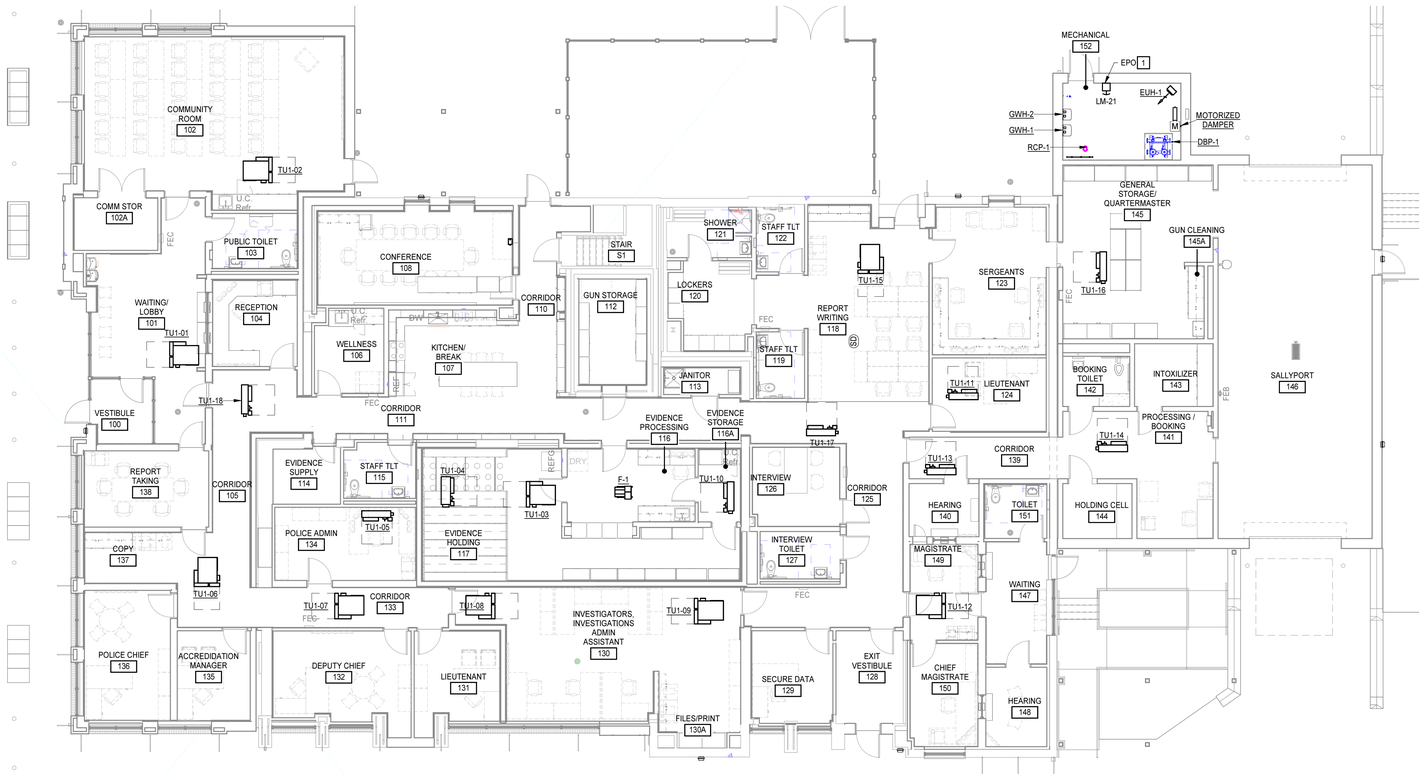
TAG	VOLTAGE	# POLES	PANEL	CCT#	WIRE	DISCONNECTING MEANS	REMARKS
DBP-1	208 V	3	LM	46,48,50	4#6, #10G,1"C	NOTE 2	
EUH-1	208 V	2	LM	47,49	3#12, #12G, 3/4"C	NOTE 1	
EUH-2	208 V	2	LM	53,55	3#12, #12G,3/4"C	NOTE 1	
F-1	120 V	1	L1	5	2#12, #12G,3/4"C	NOTE 3	CONNECT TO LIGHT CKT IN THE ROOM
F-6	120 V	1	L2	2	2#12, #12G,3/4"C	NOTE 3	CONNECT TO LIGHT CKT IN THE ROOM
GWH-1	120 V	1	LM	3	2#12, #12G,3/4"C	NOTE 2	
GWH-2	120 V	1	LM	3	2#12, #12G,3/4"C	NOTE 2	
MOTORIZED DAMPER	120 V	1	LM	28	2#12, #12G,3/4"C	NOTE 1	
RCP-1	120 V	1	LM	6	2#12, #12G,3/4"C	NOTE 2	
SSI-01	208 V	2	LM	17,19	3#12, #12G,3/4"C	NOTE 1	FED FROM OUTDOOR UNIT
TU1-01	208 V	3	LM	12,14,16	4#10, #10G,3/4"C	NOTE 1	
TU1-02	208 V	3	LM	18,20,22	4#10, #10G,3/4"C	NOTE 1	
TU1-03	208 V	2	LM	31,33	3#10, #10G,3/4"C	NOTE 1	
TU1-04	120 V	1	LM	7	2#10, #10G,3/4"C	NOTE 1	
TU1-05	120 V	1	LM	2	2#12, #12G,3/4"C	NOTE 1	
TU1-06	208 V	2	LM	27,29	3#10, #10G,3/4"C	NOTE 1	
TU1-07	208 V	3	LM	34,36,38	4#12, #12G,3/4"C	NOTE 1	
TU1-08	208 V	2	LM	30,32	3#10, #10G,3/4"C	NOTE 1	
TU1-09	208 V	3	LM	41,43,45	4#10, #10G,3/4"C	NOTE 1	
TU1-10	120 V	1	LM	8	2#12, #12G,3/4"C	NOTE 1	
TU1-11	120 V	1	LM	5	2#12, #12G,3/4"C	NOTE 1	
TU1-12	208 V	3	LM	11,13,15	4#12, #12G,3/4"C	NOTE 1	
TU1-13	120 V	1	LM	26	2#12, #12G,3/4"C	NOTE 1	
TU1-14	120 V	1	LM	9	2#12, #12G,3/4"C	NOTE 1	
TU1-15	208 V	2	LM	35,37	3#12, #12G,3/4"C	NOTE 1	
TU1-16	120 V	1	LM	24	2#8, #10G,3/4"C	NOTE 1	
TU1-17	120 V	1	LM	51	2#12, #12G,3/4"C	NOTE 1	
TU1-18	120 V	1	LM	52	2#12, #12G,3/4"C	NOTE 1	
TU1-19	208 V	3	LM	40,42,44	4#10, #10G,3/4"C	NOTE 1	

NOTES:
1. PROVIDED BY DIVISION 23.
2. PROVIDED BY DIVISION 22
3. CONTROLLED BY LIGHTING SWITCH. REFER TO LIGHTING PLANS FOR ADDITIONAL INFORMATION.



SECOND FLOOR PLAN - MECH POWER

1/8" = 1'-0"



FIRST FLOOR PLAN - MECH POWER

1/8" = 1'-0"

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BRIAN C. WELLS
Lic. No. 046269
10-21-26
PROFESSIONAL ENGINEER

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TOWN OF SOUTH HILL
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FLOOR PLANS - MECH POWER

E1.1.4

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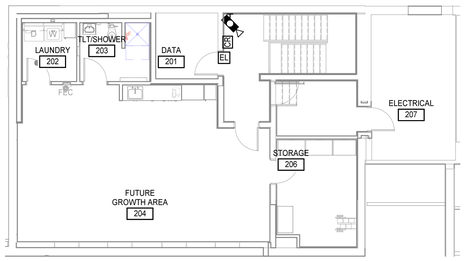
GENERAL NOTES

A. PROVIDE CONDUITS/JUNCTION BOXES FOR SECURITY SYSTEM. DEVICES/EQUIPMENT, AND CABLES SHALL BE PROVIDED BY OWNER. COORDINATE SECURITY SYSTEM WITH ARCHITECT/SECURITY ENGINEER.

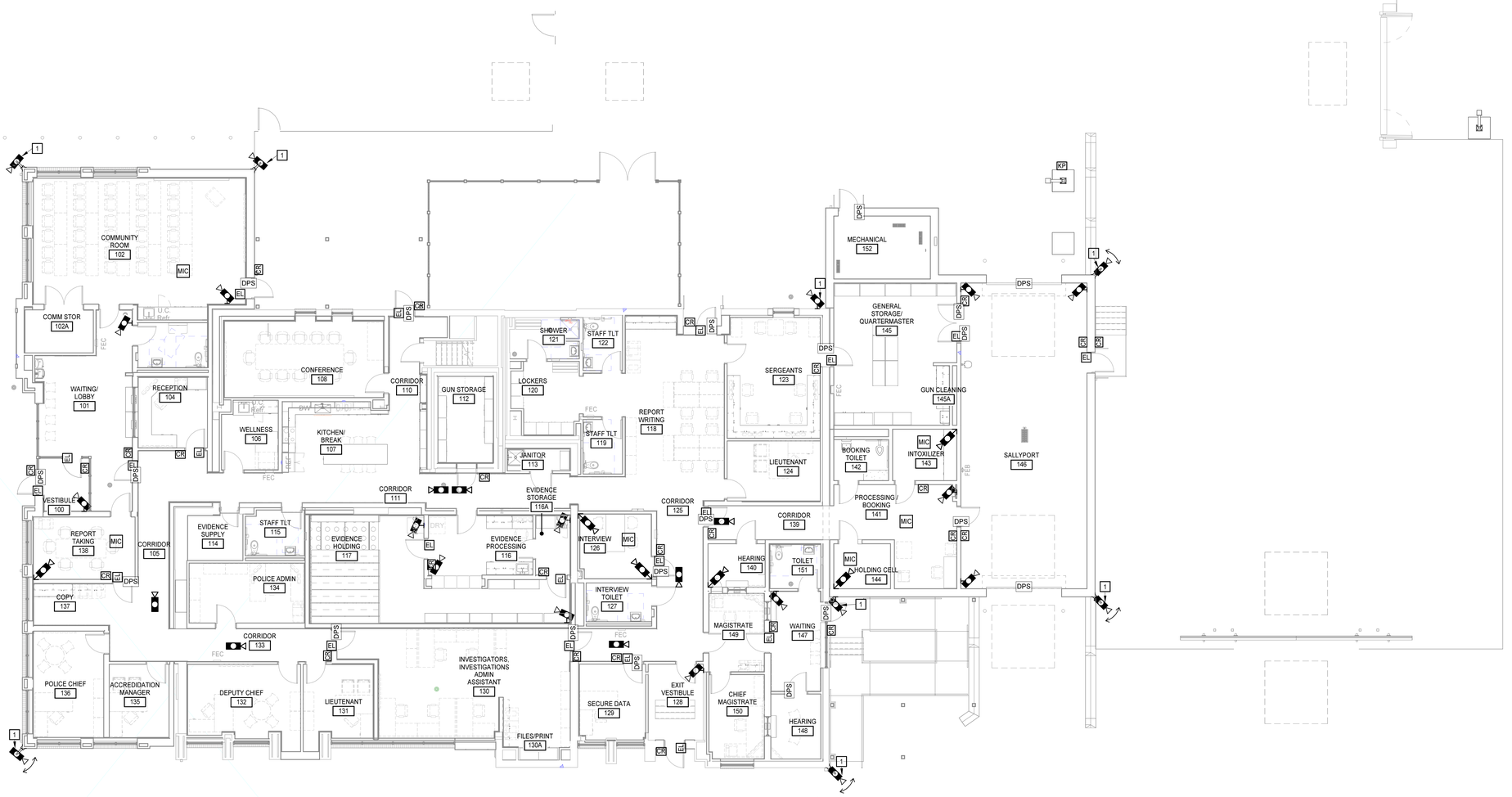
KEYNOTES

APPLIES TO DRAWINGS E1.1.5
REPRESENTED BY n

1. MOUNT EXTERIOR CAMERA 12' AFF.



SECURITY ELECTRONICS - SECOND FLOOR FLOOR PLAN
1/8" = 1'-0"



FIRST FLOOR PLAN - SECURITY SYSTEM
1/8" = 1'-0"

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BRIAN C. WELLS
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DATE	DESCRIPTION

SECURITY FLOOR PLANS

E1.1.5

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GENERAL NOTES

A. COORDINATE LOCATION OF ALL DISCONNECTS, CONTROL PANELS, & ELECTRICAL CONNECTIONS WITH MECHANICAL

KEYNOTES

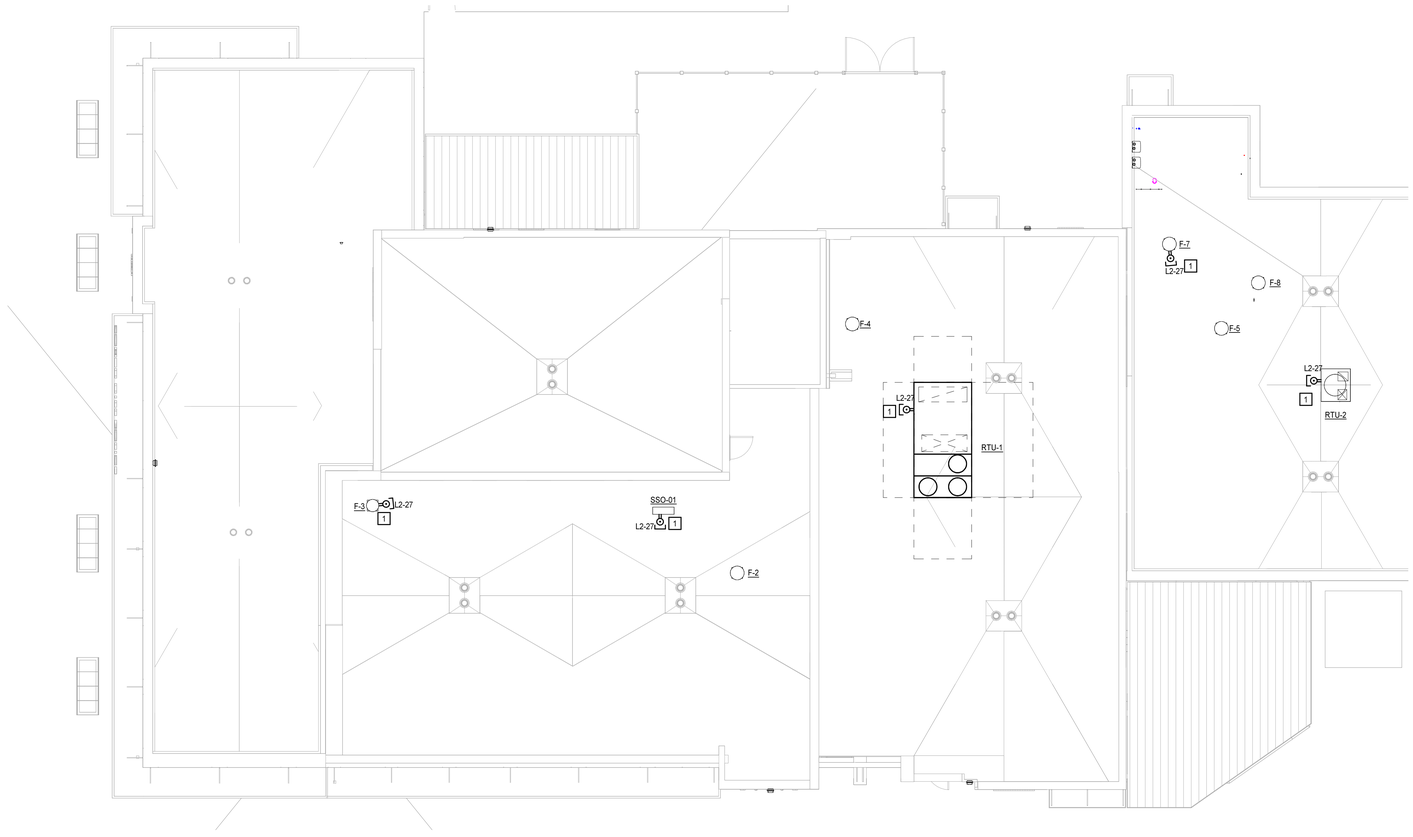
APPLIES TO DRAWINGS E1.2
REPRESENTED BY [n]

1. MOUNT ON EQUIPMENT.

DIV 23 ELECTRICAL CONNECTION SCHEDULE - E1.2

TAG	VOLTAGE	# POLES	PANEL	CCT#	WIRE	DISCONNECTING MEANS	REMARKS
F-2	120 V	1	LM	1	2#12, #12G, 3/4"C	NOTE 1	
F-3	120 V	1	LM	25	2#12, #12G, 3/4"C	NOTE 1	
F-4	120 V	1	LM	4	2#12, #12G, 3/4"C	NOTE 1	
F-5	120 V	1	LM	23	2#12, #12G, 3/4"C	NOTE 1	
F-7	120 V	1	LM	10	2#12, #12G,3/4"C	NOTE 1	
F-8	120 V	1	LM	39	2#12, #12G,3/4"C	NOTE 1	
RTU-1	208 V	3	EDP	8,10,12	4#3/0, #6G, 2"C	NOTE 1	
RTU-2	208 V	2	EDP	14,16	3#10, #10G,3/4"C	NOTE 2	
SSO-01	208 V	2	LM	17,19	3#12, #12G, 3/4"C	NOTE 2	

NOTES:
1. PROVIDED BY DIVISION 23.
2. PROVIDE A 208V/1P 30A NEMA 3R NON-FUSE DISCONNECT. MOUNT ON OR ADJACENT TO THE UNIT MAINTAINING 4 FEET CLEARANCE IN FRONT OF DISCONNECT AND WITHOUT BLOCKING ANY SERVICE DOORS OR COVERS. LOCATION SHALL BE FIELD DETERMINED.



ROOF PLAN - ELECTRICAL
1/8" = 1'-0"

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
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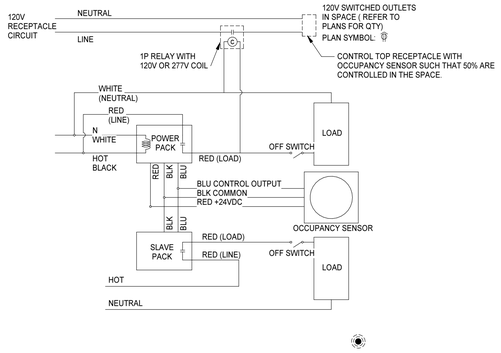
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

ROOF PLAN - ELECTRICAL

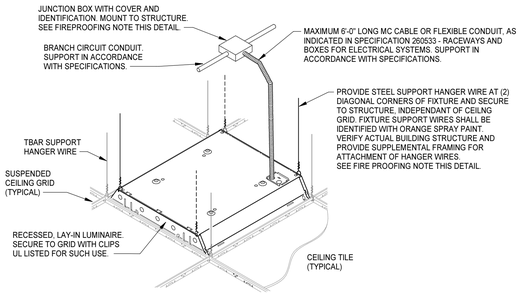
E1.2

10/21/2026 11:18:22 AM



OCCUPANCY SENSOR DIAGRAM AUXILARY RELAY PACK SENSOR

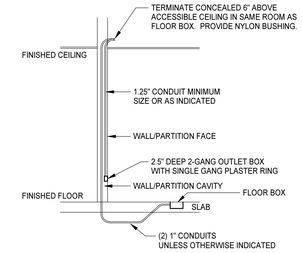
NO SCALE



FIREPROOFING NOTE:
THIS DETAIL APPLIES TO UNPROTECTED STRUCTURE ONLY. IF THE BUILDING STRUCTURE REQUIRES FIREPROOFING, INSTALL BOXES AND CONDUIT WITH A METHOD THAT MAINTAINS THE INTEGRITY OF THE FIREPROOFING METHOD. COORDINATE METHOD AND SCHEDULING WITH DIVISION 7.

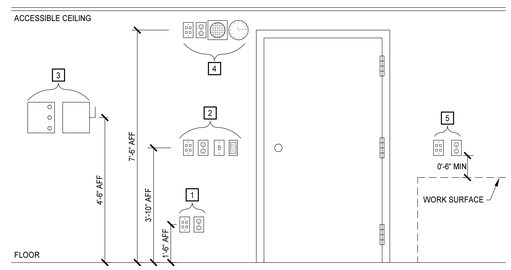
TROFFER MOUNTING DETAIL

NO SCALE



TELECOMMUNICATIONS OUTLET CONDUIT DETAIL - FLOOR BOX

NO SCALE



KEY NOTES:

1. RECEPTACLE OR TELECOMMUNICATIONS DEVICES MOUNTED AT 1'-6" AFF UNO ON FLOOR PLAN
2. RECEPTACLE, TELECOMMUNICATIONS DEVICES, LIGHT SWITCH, POWER DEVICES / EQUIPMENT OR CARD READER MOUNTED AT 3'-10" AFF UNO ON FLOOR PLAN
3. POWER DEVICES / EQUIPMENT MOUNTED AT 4'-6" AFF UNO ON FLOOR PLAN. IF EQUIPMENT HAS HANDLE OR SWITCHES, MIDDLE OF HANDLE OR SWITCH SHALL BE AT 4'-6" AFF UNO.
4. RECEPTACLE OR TELECOMMUNICATIONS DEVICES MOUNTED AT 7'-6" AFF UNO ON FLOOR PLAN
5. RECEPTACLE OR TELECOMMUNICATIONS DEVICES MOUNTED ABOVE WORK SURFACE

REFER TO ARCHITECTURAL DRAWINGS FOR HEIGHTS AND ELEVATIONS OF ALL WORK SURFACES

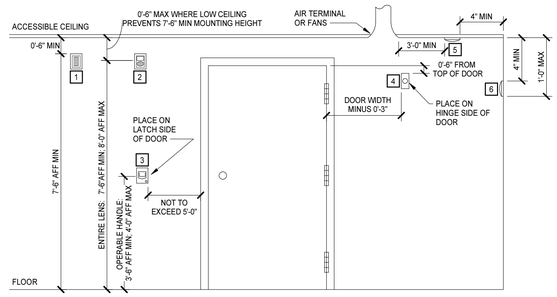
LEGEND SYMBOL: REFER TO RECEPTACLES DEVICE AND COMMUNICATIONS LEGEND FOR COMPLETE LIST OF SYMBOLS

LEGEND SYMBOL: CR OR KP OR S OR SS
REFER TO RECEPTACLES DEVICE, COMMUNICATIONS, POWER DEVICES / EQUIPMENT LEGEND FOR COMPLETE LIST OF SYMBOLS

LEGEND SYMBOL: REFER TO POWER DEVICES / EQUIPMENT LEGEND FOR COMPLETE LIST OF SYMBOLS

LEGEND SYMBOL: REFER TO RECEPTACLES DEVICE, COMMUNICATIONS, POWER DEVICES / EQUIPMENT LEGEND FOR COMPLETE LIST OF SYMBOLS

NOTES:
1. ALL DEVICES MOUNTED ABOVE NON-ADA COMPLIANT WORK SURFACES SHALL BE INSTALLED WITH BOTTOM OF DEVICE 0'-6" MINIMUM ABOVE WORK SURFACE.
2. ALL DEVICES MOUNTED ABOVE ADA COMPLAINT WORK SURFACES SHALL ADHERE TO THE FOLLOWING:
   A. BOTTOM OF DEVICE SHALL BE 0'-6" MINIMUM ABOVE WORK SURFACE.
   B. TOP OF DEVICE SHALL BE NO HIGHER THAN 3'-8" ABOVE WORK SURFACE FOR OBSTRUCTED FORWARD REACH.
   C. TOP OF DEVICE SHALL BE NO HIGHER THAN 3'-10" ABOVE WORK SURFACE FOR OBSTRUCTED SIDE REACH.

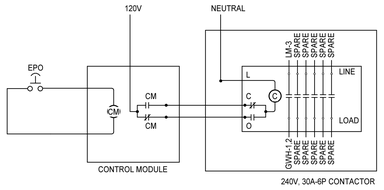


KEY NOTES:

1. FIRE ALARM AUDIO ONLY DEVICE. LEGEND SYMBOL:
2. FIRE ALARM VISUAL ONLY DEVICE OR FIRE ALARM AUDIO/VISUAL DEVICE. LEGEND SYMBOL: OR
3. FIRE ALARM MANUAL PULL STATION OR FIRE ALARM KEY OPERATED MANUAL PULL STATION. LEGEND SYMBOL: F OR FK
4. FIRE ALARM MAGNETIC DOOR HOLDER LEGEND SYMBOL: M
5. FIRE ALARM INITIATING DEVICES - CEILING MOUNTED: SMOKE, HEAT, CARBON MONOXIDE OR COMBO DETECTORS LEGEND SYMBOL: S OR H OR CO OR SC
6. FIRE ALARM INITIATING DEVICES - WALL MOUNTED: SMOKE, HEAT, CARBON MONOXIDE OR COMBO DETECTORS LEGEND SYMBOL: S OR H OR CO OR SC

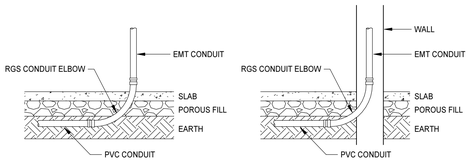
E5 TYPICAL DEVICE ELEVATION DETAIL

NO SCALE



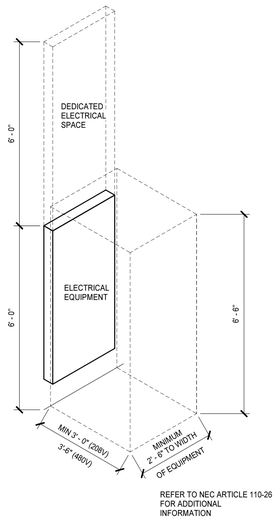
ROOM 152 - GAS APPLIANCE EPO DIAGRAM

NO SCALE



PVC TO EMT TRANSITION DETAIL

NO SCALE



REFER TO NEC ARTICLE 110-26 FOR ADDITIONAL INFORMATION

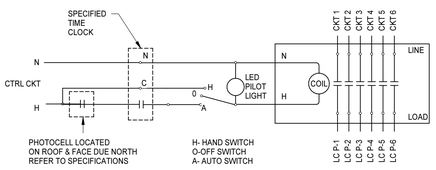
EQUIPMENT CLEARANCES

NO SCALE

EXTERIOR LIGHTING CONTROL PANEL - LCP

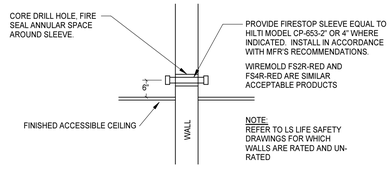
LOCATION: ELEC 207 (CTRL CKT : XL-3)

CKT #	CONTACTOR#	DESCRIPTION	PHOTOCELL	TIME CLOCK
XL-3	LCP-1	SOUTH WEST CANOPY	X	X
XL-3	LCP2	NORTH WEST CANOPIES	X	X
XL-4	LCP-3	SOUTH EAST CANOPY & VEST. 128 WALL PACK	X	X
XL-4	LCP-4	WALL PACKS AND SALLYPORT & RM 118 CANOPY	X	X
XL-3	LCP-5	POLICE SCONCES	X	X
XX	LCP-6	SPARE	X	X



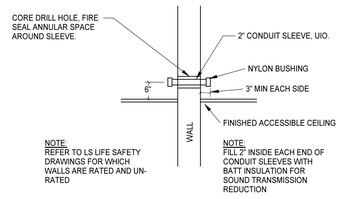
LIGHTING CONTACTOR DETAIL - TIME CLOCK AND PHOTOCELL

NO SCALE



RATED WALL CONDUIT SLEEVE DETAIL

NO SCALE



UN-RATED WALL CONDUIT SLEEVE DETAIL

NO SCALE

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
BRIAN C. WELLS
Lic. No. 046269
10-21-26
PROFESSIONAL ENGINEER

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

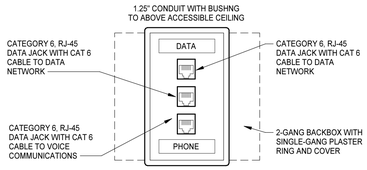
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

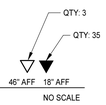
DETAILS

E5.1

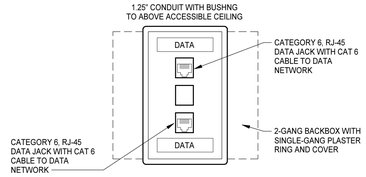
11/2/2026 10:56:37 AM



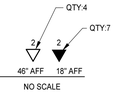
TELECOMMUNICATIONS
OUTLET DETAIL - TYPE 1



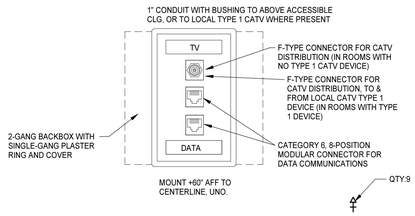
NO SCALE



TELECOMMUNICATIONS
OUTLET DETAIL - TYPE 2

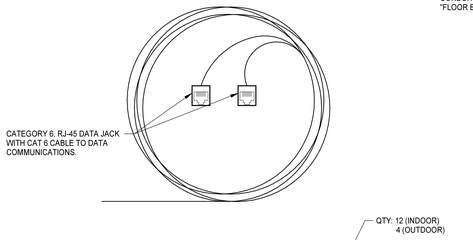


NO SCALE



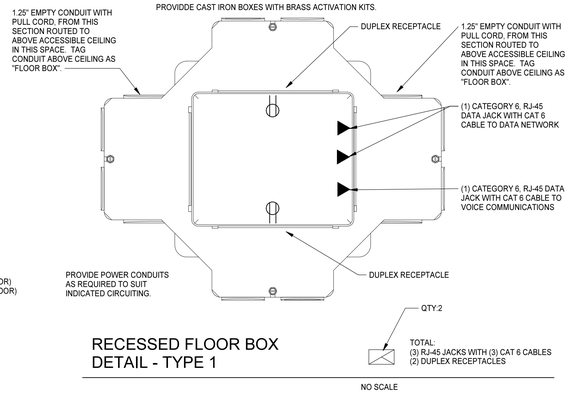
CATV / DATA OUTLET DETAIL - TYPE 1

NO SCALE



WIRELESS ACCESS POINT
DETAIL

NO SCALE



RECESSED FLOOR BOX
DETAIL - TYPE 1

NO SCALE

TELECOMMUNICATION OUTLET DETAILS

NO SCALE

Moseley
3200 NORFOLK STREET, RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
BRIAN C. WELLS
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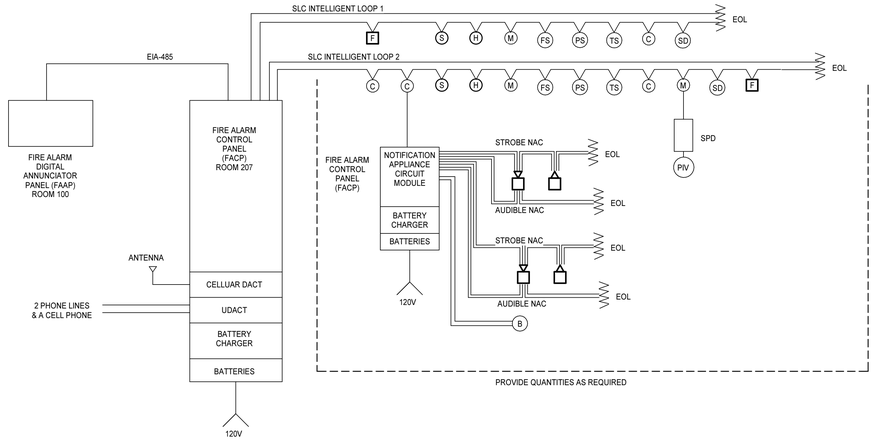
PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

DETAILS

E5.2

10/21/2026 11:18:23 AM



FIRE ALARM RISER DIAGRAM

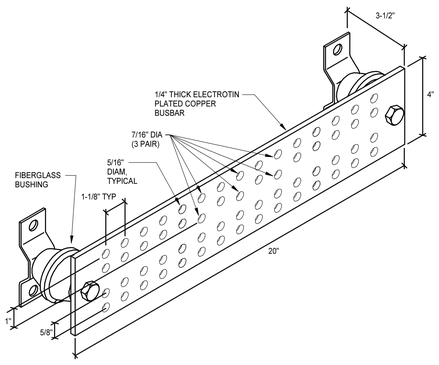
NO SCALE

FIRE ALARM INPUT/OUTPUT MATRIX

		CONTROL UNIT ANNUNCIATION								NOTIFICATION / ACTION						
		ACTUATE COMMON ALARM SIGNAL INDICATOR	ACTUATE AUDIBLE ALARM SIGNAL	ACTUATE ALARM INDICATOR	ACTUATE COMMON SUPERVISORY SIGNAL INDICATOR	ACTUATE AUDIBLE SUPERVISORY SIGNAL	ACTUATE COMMON TROUBLE SIGNAL INDICATOR	ACTUATE AUDIBLE COMMON TROUBLE SIGNAL	ANNUNCIATE AT TEXT ANNUCIATORS	ACTUATE NOTIFICATION APPLIANCE	ACTUATE SPRINKLER FLOW BELL	DISPLAY CHANGE OF STATUS	TRANSMIT ALARM SIGNAL TO SUPERVISING STATION	TRANSMIT SUPERVISORY SIGNAL TO SUPERVISING STATION	TRANSMIT TROUBLE SIGNAL TO SUPERVISING STATION
		A	B	C	D	E	F	G	H	J	K	L	M	N	P
1	MANUAL PULL STATION	X	X	X					X	X		X	X		
2	SMOKE DETECTOR	X	X	X					X	X		X	X		
3	DUCT SMOKE DETECTOR	X	X	X					X	X		X	X		
4	HEAT DETECTOR	X	X	X					X	X		X	X		
5	SPRINKLER SYSTEM WATERFLOW	X	X	X					X	X	X	X	X		
6	SPRINKLER VALVE TAMPER SWITCH				X	X			X			X		X	
7	MONITOR MODULE - GENERATOR FAILURE				X	X			X			X		X	
8	MONITOR MODULE - GENERATOR RUN						X	X	X			X		X	
9	FIRE ALARM AC POWER FAILURE						X	X	X			X			X
10	FIRE ALARM SYSTEM LOW BATTERY						X	X	X			X			X
11	FIRE ALARM OPEN CIRCUIT						X	X	X			X			X
12	FIRE ALARM GROUND FAULT						X	X	X			X			X
13	FIRE ALARM NOTIFICATION APPLIANCE CIRCUIT SHORT						X	X	X			X			X

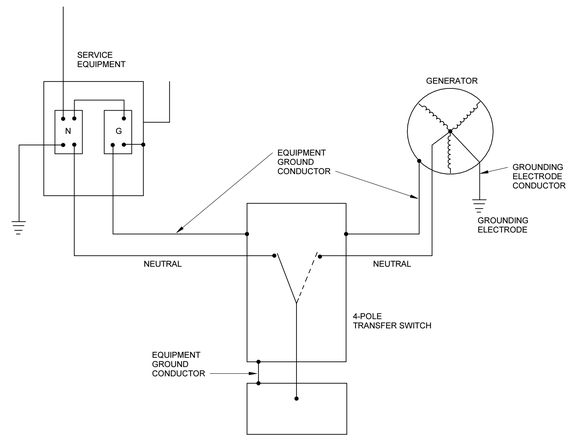
FIRE ALARM INPUT - OUTPUT MATRIX

NO SCALE



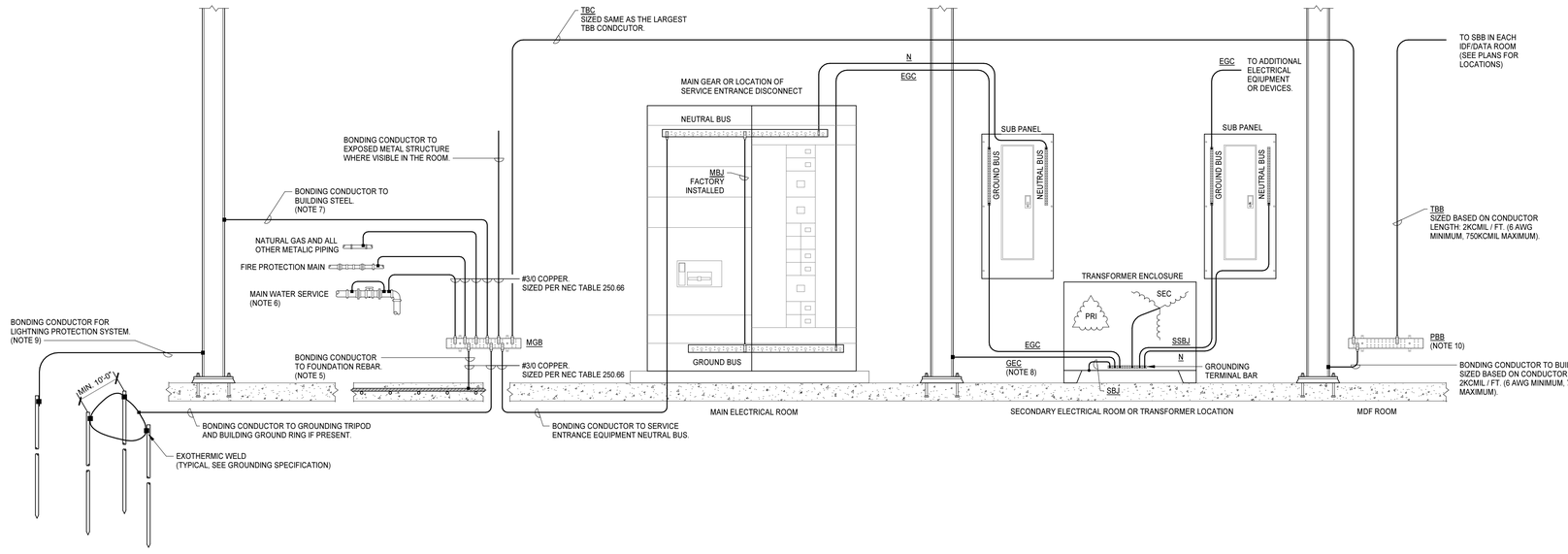
TELECOMMUNICATIONS PRIMARY BONDING BUSBAR (PBB) DETAIL

NO SCALE



4-POLE GENERATOR GROUNDING DETAIL

NO SCALE



E5 GROUNDING SYSTEM DIAGRAM DETAIL_26

NO SCALE

NOTES:

1. SEE SPECIFICATION SECTION 260526 - "GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS," AS WELL AS NEC 250 FOR ADDITIONAL INFORMATION.
2. PROVIDE ALL WIRING, RACEWAYS, FITTINGS AND CONNECTIONS AS INDICATED ON THIS DIAGRAM.
3. AHJ SHALL INSPECT BONDING CONNECTIONS AT COLUMNS, FOUNDATION REBAR, GROUNDING TRIPOD AND GROUND RING WHILE THEY ARE ACCESSIBLE.
4. ALL GROUNDING CONDUCTORS SHALL BE INSTALLED IN CONDUIT WHERE INSTALLED ON WALLS IN ELECTRICAL ROOMS. PROVIDE GROUNDING FITTINGS ON BOTH ENDS PER NEC 250.64(B), (E).
5. REBAR SHALL BE BONDED IF IT IS MINIMUM 1/2" DIAMETER, MIN 20' LENGTH. ELECTRICALLY CONDUCTIVE STEEL (OR SMALLER LENGTHS CONNECTED TOGETHER WITH STEEL TIE WIRES OR WELDING TO CREATE LENGTHS 20' OR GREATER), ENCASED BY MIN 2" CONCRETE IN BUILDING FOUNDATION IN DIRECT CONTACT WITH THE EARTH.
6. ALL METAL PIPING SHALL BE BONDED WITHIN 5' OF ENTRY INTO THE BUILDING. PROVIDE BONDING JUMPER AROUND METERS, FILTERING DEVICES OR OTHER INSULATING COMPONENTS.
7. IF BUILDING STEEL IS ELECTRICALLY CONTINUOUS THROUGHOUT THE BUILDING, STEEL MAY BE BONDED IN ONLY ONE LOCATION. IF BUILDING STEEL IS NOT CONTINUOUS: BOND ALL BUILDING STEEL ELECTRODES (EXTENDS 10' MINIMUM VERTICALLY INTO THE EARTH) TO THE GROUNDING ELECTRODE SYSTEM. ALL CONNECTIONS TO BUILDING STEEL SHALL BE EXOTHERMICALLY WELDED.
8. TRANSFORMER GROUNDING ELECTRODE CONDUCTOR SHALL BE BONDED TO BUILDING STEEL IF STEEL IS ELECTRICALLY CONTINUOUS AS AN EXTENSION OF THE GROUNDING ELECTRODE SYSTEM. IF BUILDING STEEL IS NOT CONTINUOUS, PROVIDE GEC BACK TO NEAREST LOCATION OF GROUNDING ELECTRODE SYSTEM. GEC SHALL BE SIZED PER TRANSFORMER SCHEDULE.
9. IF SPECIFICATION SECTION 264113 IS INDICATED IN THE PROJECT MANUAL, PROVIDE GROUND ROD AND BONDING JUMPER AT EACH CORNER COLUMN AND INTERMEDIATE EXTERIOR COLUMN, NO GREATER THAN 60' APART. SEE SPECIFICATION SECTION 264113 - "LIGHTNING PROTECTION FOR STRUCTURES" FOR ADDITIONAL INFORMATION.
10. SEE SPECIFICATION SECTION 270526 - "GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS" FOR ADDITIONAL INFORMATION REGARDING TELECOM SYSTEMS.

ABBREVIATIONS:

EGC - EQUIPMENT GROUNDING CONDUCTOR
GEC - GROUNDING ELECTRODE CONDUCTOR
MBJ - MAIN BONDING JUMPER
MGB - MAIN GROUND BAR
N - NEUTRAL
PBB - PRIMARY BONDING BUSBAR (TELECOM)
SBB - SECONDARY BONDING BUSBAR (TELECOM)
SBJ - SYSTEM BONDING JUMPER
SSBJ - SUPPLY SIDE BONDING JUMPER
TBB - TELECOM BONDING BACKBONE
TBC - TELECOM BONDING CONDUCTOR

Moseley
3200 NORFOLK STREET. RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
BRIAN C. WELLS
Lic. No. 046269
10-21-26
PROFESSIONAL ENGINEER

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

DETAILS

E5.3

10/21/2026 11:18:23 AM

PANELBOARD SCHEDULE — MDP

LOCATION: ELECTRICAL 205 — FED FROM: UTILITY

1200 AMP MCB SE RATED — 120/208 Wye — 3 PH 4 W — MOUNT: SURFACE — PANEL ASSEMBLY RATED (KAIC): 42KAIC

CKT	BRKR	POLE	LOAD	A	B	C	LOAD	POLE	BRKR	CKT
1				2.5	79.5					2
3	100 A	3	ATS-X			5.5	101.6	ATS-E	3	1000 A	4
5						4.1	80.2				6
7	100 A	2	SPARE	0.0	0.0			SPARE	2	100 A	8
9					0.0	0.0					10
11							0.0	--			12
13	225 A	3	SPARE	0.0	--			SPACE ONLY	3	--	14
15					0.0	--					16
17	--	1	SPACE ONLY				--	--	SPACE ONLY	1	--	18
19				--	--							20
21	--	3	SPACE ONLY			--	--	SPACE ONLY	3	--	22
23							--	--				24
25				--	--							26
27	--	3	SPACE ONLY			--	--	SPACE ONLY	3	--	28
29							--	--				30
31				--	--							32
33	--	3	SPACE ONLY			--	--	SPACE ONLY	3	--	34
35							--	--				36
37				--	0.0							38
39	--	3	SPACE ONLY			--	0.0	SPD	3	60 A	40
41							--	0.0				42
				82 kVA		107 kVA		84 kVA			
				683 A		896 A		706 A			

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	9056 VA	125.00%	11320 VA
EXTERIOR LIGHTING	490 VA	125.00%	613 VA
RECEPTACLES	35640 VA	64.03%	22820 VA
AC / HEAT PUMP	167371 VA	100.00%	167371 VA
ELECTRIC HEAT	6600 VA	100.00%	6600 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	51820 VA	100.00%	51820 VA

Panel Totals

Total Conn. Load: 273.4 kVA
Total Est. Demand: 262.9 kVA
Total Conn. Current: 759 A
Total Est. Demand Current: 730 A

NOTES FOR SWITCHBOARD "MDP":
1. SWITCHBOARD SHALL BE UL SERVICE ENTRANCE RATED
2. PROVIDE SPD WITH OVERCURRENT DEVICE, DISCONECTING MEANS & CONDUCTORS, SIZE PER SPD MFR REQUIREMENTS MOUNTED ON TOP OF EQUIPMENT.
3. PROVIDE DISCONNECTING MEANS LABEL PER 2020 NEC 230.70(B)
4. PROVIDE GROUND FAULT PROTECTIVE RELAY, DOCUMENT TEST. PROVIDE PHASE LOSS AND UNDERVOLTAGE DRY CONTACT FOR BAS PICKUP.
5. PROVIDE FACTORY INSTALLED DIGITAL MULTIMETER, PLUS MONITORING CABLE IN CONDUIT TO BAS PICKUP MODULE. COORDINATE WITH DIV 23.
6. PROVIDE SIGN PER NEC 700: "LIFE SAFETY STANDBY FROM GENERATOR LOCATED IN EQUIPMENT YARD OUTSIDE, VIA ATS-X"
7. PROVIDE SIGN PER NEC 702: "OPTIONAL STANDBY FROM GENERATOR LOCATED IN EQUIPMENT YARD OUTSIDE, VIA ATS-E

COPPER FEEDER SCHEDULE

FEEDER ID	# OF SETS	BUILDING WIRE QUANTITY & SIZE TYPE THHN - DRY TYPE THWN - WET	MINIMUM CONDUIT SIZE	FEEDER ID	# OF SETS	BUILDING WIRE QUANTITY & SIZE TYPE THHN - DRY TYPE THWN - WET	MINIMUM CONDUIT SIZE	FEEDER ID	# OF SETS	BUILDING WIRE QUANTITY & SIZE TYPE THHN - DRY TYPE THWN - WET	MINIMUM CONDUIT SIZE
20S	1	2#12,#12 G	3/4"	20	1	3#12,#12 G	3/4"	20Y	1	4#12,#12 G	3/4"
30S	1	2#10,#10 G	3/4"	30	1	3#10,#10 G	3/4"	30Y	1	4#10,#10 G	3/4"
35S	1	2#8,#10 G	3/4"	35	1	3#8,#10 G	3/4"	35Y	1	4#8,#10 G	3/4"
40S	1	2#8,#10 G	3/4"	40	1	3#8,#10 G	3/4"	40Y	1	4#8,#10 G	3/4"
45S	1	2#6,#10 G	1"	45	1	3#6,#10 G	1"	45Y	1	4#6,#10 G	1"
50S	1	2#6,#10 G	1"	50	1	3#6,#10 G	1"	50Y	1	4#6,#10 G	1"
60S	1	2#4,#10 G	1"	60	1	3#4,#10 G	1"	60Y	1	4#4,#10 G	1"
70S	1	2#4,#8 G	1 1/4"	70	1	3#4,#8 G	1 1/4"	70Y	1	4#4,#8 G	1 1/4"
80S	1	2#3,#8 G	1 1/4"	80	1	3#3,#8 G	1 1/4"	80Y	1	4#3,#8 G	1 1/4"
90S	1	2#2,#8 G	1 1/4"	90	1	3#2,#8 G	1 1/4"	90Y	1	4#2,#8 G	1 1/4"
100S	1	2#1,#6 G	1 1/4"	100	1	3#1,#6 G	1 1/4"	100Y	1	4#1,#6 G	2"
110S	1	2#1,#6 G	1 1/2"	110	1	3#1,#6 G	1 1/2"	110Y	1	4#1,#6 G	2"
125S	1	2#1,#6 G	1 1/2"	125	1	3#1,#6 G	1 1/2"	125Y	1	4#1,#6 G	2"
150S	1	2#1/0,#6 G	2"	150	1	3#1/0,#6 G	2"	150Y	1	4#1/0,#6 G	2"
175S	1	2#2/0,#6 G	2"	175	1	3#2/0,#6 G	2"	175Y	1	4#2/0,#6 G	2"
200S	1	2#3/0,#6 G	2"	200	1	3#3/0,#6 G	2"	200Y	1	4#3/0,#6 G	2"
225S	1	2#4/0,#4 G	2 1/2"	225	1	3#4/0,#4 G	2 1/2"	225Y	1	4#4/0,#4 G	2 1/2"
250S	1	2-250kCM,#4 G	2 1/2"	250	1	3-250kCM,#4 G	2 1/2"	250Y	1	4-250kCM,#4 G	2 1/2"
300S	1	2-350kCM,#4 G	2 1/2"	300	1	3-350kCM,#4 G	2 1/2"	300Y	1	4-350kCM,#4 G	2 1/2"
350S	2	2#2/0,#3 G	2"	350	2	3#2/0,#3 G	2"	350Y	2	4#2/0,#3 G	2"
400S	2	2#3/0,#3 G	2"	400	2	3#3/0,#3 G	2"	400Y	2	4#3/0,#3 G	2"
450S	2	2#4/0,#2 G	2 1/2"	450	2	3#4/0,#2 G	2 1/2"	450Y	2	4#4/0,#2 G	2 1/2"
500S	2	2-250kCM,#2 G	2 1/2"	500	2	3-250kCM,#2 G	2 1/2"	500Y	2	4-250kCM,#2 G	2 1/2"
600S	2	2-350kCM,#1 G	3"	600	2	3-350kCM,#1 G	3"	600Y	2	4-350kCM,#1 G	3"
700S	2	2-500kCM,#1/0 G	4"	700	2	3-500kCM,#1/0 G	4"	700Y	2	4-500kCM,#1/0 G	4"
800S	3	2-350kCM,#1/0 G	3"	800	3	3-350kCM,#1/0 G	3"	800Y	3	4-350kCM,#1/0 G	3"
1000S	3	2-500kCM,#2/0 G	4"	1000	3	3-500kCM,#2/0 G	4"	1000Y	3	4-500kCM,#2/0 G	4"
1200S	4	2-350kCM,#3/0 G	3"	1200	4	3-350kCM,#3/0 G	3"	1200Y	4	4-350kCM,#3/0 G	3"
1600S	5	2-500kCM,#4/0 G	4"	1600	5	3-500kCM,#4/0 G	4"	1600Y	5	4-500kCM,#4/0 G	4"
2000S	6	2-500kCM,#250 G	4"	2000	6	3-500kCM,#250 G	4"	2000Y	6	4-500kCM,#250 G	4"
2500S	7	2-500kCM,#350 G	4"	2500	7	3-500kCM,#350 G	4"	2500Y	7	4-500kCM,#350 G	4"
								1200N	4	4-350kCM	4"

NOTES:
1. VERIFY CONDUIT SIZE REQUIRED IF WIRE TYPES OTHER THAN THOSE LISTED ABOVE ARE USED.
2. FEEDER SIZES BASED ON TABLE 310.15(B)(16), 75° C.
3. SIZES ADJUSTED PER NEC 110.14.

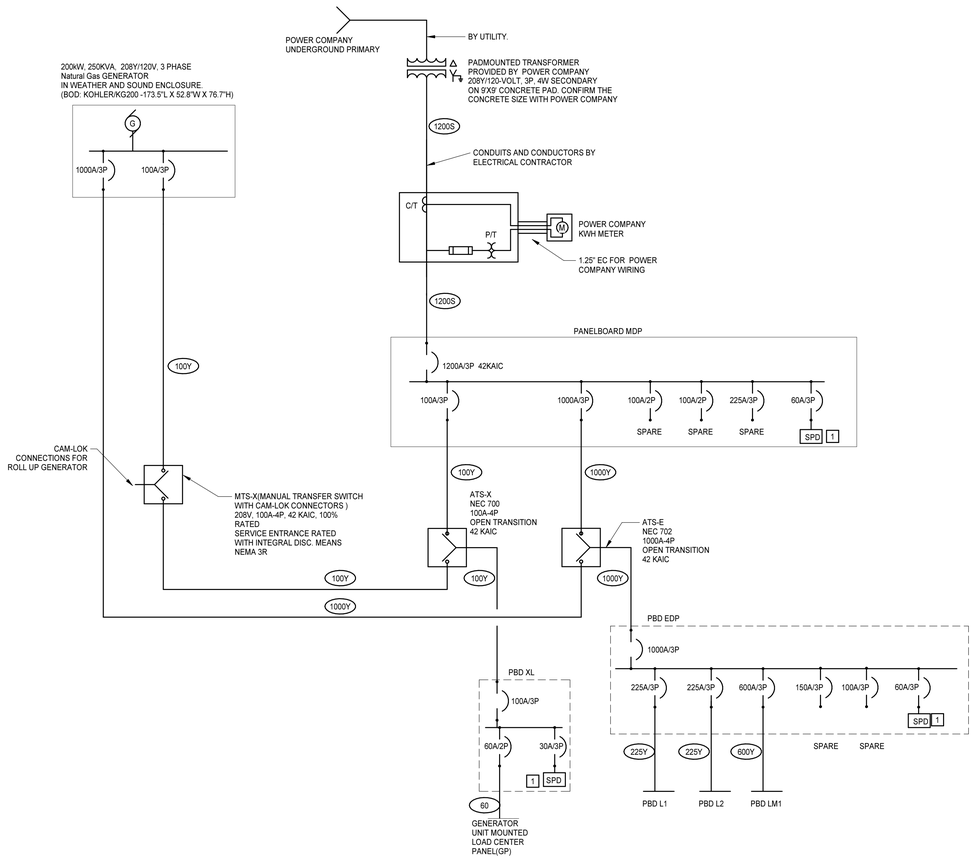
GENERAL NOTES

A. REFER TO PANEL SCHEDULES FOR PANEL CHARACTERISTICS INCLUDING MAIN BREAKER REQUIREMENTS.

KEYNOTES

APPLIES TO DRAWINGS E6.1
REPRESENTED BY: n

1. COORDINATE WITH SPD MANUFACTURER FOR SPD BREAKER SIZE.



POLICE STATION POWER ONE LINE DIAGRAM
NO SCALE

Moseley
3200 NORFOLK STREET . RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
BRIAN C. WELLS
Lic. No. 046269
10-21-26
PROFESSIONAL ENGINEER

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 — DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS

DATE	DESCRIPTION

POWER ONE-LINE DIAGRAM

E6.1

10/21/2026 11:18:24 AM

PANELBOARD SCHEDULE — EDP

LOCATION: ELECTRICAL 205 | FED FROM: ATS-E

1000 AMP MCB | 120/208 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 42 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1				16.5	11.9								2
3	225 A	3	PBD L1			20.3	12.0			PBD L2	3	225 A	4
5								16.6	7.6				6
7				30.9	18.0								8
9	600 A	3	PBD LM			49.0	18.0			RTU-1	3	200 A	10
11								38.0	18.0				12
13				0.0	2.2								14
15	225 A	3	SPARE			0.0	2.2			RTU-2	2	30 A	16
17								0.0	0.0	SPARE	1	20 A	18
19				--	--					SPACE ONLY	1	--	20
21	--	3	SPACE ONLY			--	--			SPACE ONLY	1	--	22
23								--	--	SPACE ONLY	1	--	24
25				--	--								26
27	--	3	SPACE ONLY			--	--			SPACE ONLY	3	--	28
29								--	--				30
31				--	--								32
33	--	3	SPACE ONLY			--	--			SPACE ONLY	3	--	34
35								--	--				36
37				--	0.0								38
39	--	3	SPACE ONLY			--	0.0			SPD	3	60 A	40
41								--	0.0				42
				79 kVA		102 kVA		80 kVA					
				662 A		848 A		669 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 PROVIDE DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8.PROVIDE DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	6172 VA	125.00%	7715 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	35640 VA	64.03%	22820 VA
AC / HEAT PUMP	167371 VA	100.00%	167371 VA
ELECTRIC HEAT	6600 VA	100.00%	6600 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	43120 VA	100.00%	43120 VA

Panel Totals

Total Conn. Load: 261.3 kVA
Total Est. Demand: 250.0 kVA
Total Conn. Current: 725 A
Total Est. Demand Current: 694 A

PANELBOARD SCHEDULE — L1

LOCATION: ELECTRICAL 205 | FED FROM: EDP

225 AMP MLO | 120/208 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 22 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	20 A	1	INTERIOR LIGHTING	1.3	1.1					INTERIOR LIGHTING	1	20 A	2
3	20 A	1	INTERIOR LIGHTING			1.3	1.3			INTERIOR LIGHTING	1	20 A	4
5	20 A	1	INTERIOR LIGHTING & F-1					1.1	0.0	SPARE	1	20 A	6
7	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	8
9	20 A	1	REC RM 105			1.3	1.4			COFFEE MACHIEN RM 105	1	20 A	10
11	20 A	1	FRIDGE RM 102 (GP)					0.6	0.7	WATER COOLER RM 101 (GP)	1	20 A	12
13	20 A	1	REC RM 100, 101, 103, 104	0.7	0.9					REC & FLOOR BOX RM 138	1	20 A	14
15	20 A	1	PRINTER RM 138			0.7	0.7			PRINTER RM 137	1	20 A	16
17	20 A	1	REC RM 104					0.9	0.2	PRINTER RM 104	1	20 A	18
19	20 A	1	REC RM 137, 133, 105, 114, 115	0.9	1.1					REC RM 136	1	20 A	20
21	20 A	1	REC RM 135			0.7	1.1			REC RM 134	1	20 A	22
23	20 A	1	PRINTER RM 134					0.2	0.9	REC RM 132	1	20 A	24
25	20 A	1	REC RM 131	0.7	1.1					REC RM 130	1	20 A	26
27	20 A	1	REC RM 130			0.7	0.9			REC RM 130	1	20 A	28
29	20 A	1	PRINTER RM 130					0.7	0.7	REC RM 129	1	20 A	30
31	20 A	1	REC RM 128, 150	1.1	0.2					PRINTER RM 150	1	20 A	32
33	20 A	1	REC RM 147, 148, 149			0.9	0.2			PRINTER RM 149	1	20 A	34
35	20 A	1	REC RM 140, 149					0.9	1.3	REC RM 125, 126, 127	1	20 A	36
37	20 A	1	REC RM 143, 145, 146	1.3	0.9					REC RM 123	1	20 A	38
39	20 A	1	REC RM 123			0.7	1.1			REC RM 124, 139	1	20 A	40
41	20 A	1	PRINTER RM 118					0.7	1.1	REC RM 118, 119	1	20 A	42
43	20 A	1	REC RM 113, 118. 120, 121. 122	0.9	0.2					REC RM 152	1	20 A	44
45	20 A	1	REC RM 112			0.4	1.4			REC RM 116, 117	1	20 A	46
47	20 A	1	FRIDGE RM 116 (GP)					0.2	0.2	FRIDGE RM 117 (GP)	1	20 A	48
49	20 A	1	REC RM 106, 111	0.9	0.6					FRIDGE RM 106 (GP)	1	20 A	50
51	20 A	1	COFFEE MAKER RM 106			0.2	0.2			FRIDGE RM 107 (GP)	1	20 A	52
53	20 A	1	DISH WASHER RM 107					0.7	0.2	COFFEE MAKER RM 107	1	20 A	54
55	20 A	1	COFFEE MAKER RM 107	0.2	0.2					MICROWAVE RM 107	1	20 A	56
57	20 A	1	KITCHEN HOOD RM 107			0.2	3.6			STOVE/OVEN RM 107	2	50 A	58
59	20 A	1	REC RM 108					1.1	3.6				60
61	20 A	1	FLOOR BOX & REC RM 108	0.5	0.9					EXTERIOR REC	1	20 A	62
63	20 A	1	EXTERIOR REC			0.7	0.7			PRINTER RM 141	1	20 A	64
65	20 A	1	SECURE AREA REC'S					0.5	0.1	INTERCOM	1	20 A	66
67	20 A	1	LIVE SCAN RM 141	0.7	0.1					MISCELLANEOUS RECEPTION 102	1	20 A	68
69	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	70
71	20 A	1	SPARE					0.0	0.0	SPARE	1	20 A	72
73	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	74
75	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	76
77	--	1	SPACE ONLY					--	--	SPACE ONLY	1	--	78
79	--	1	SPACE ONLY	--	--					SPACE ONLY	1	--	80
81	--	1	SPACE ONLY			--	--			SPACE ONLY	1	--	82
83	--	1	SPACE ONLY					--	--	SPACE ONLY	1	--	84
				16 kVA		20 kVA		17 kVA					
				137 A		170 A		138 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 PROVIDE DED. NEUTRAL.
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(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	5448 VA	125.00%	6810 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	31500 VA	65.87%	20755 VA
AC / HEAT PUMP	0 VA	0.00%	0 VA
ELECTRIC HEAT	0 VA	0.00%	0 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	15760 VA	100.00%	15760 VA

Panel Totals

Total Conn. Load: 53.4 kVA
Total Est. Demand: 44.0 kVA
Total Conn. Current: 148 A
Total Est. Demand Current: 122 A

PANELBOARD SCHEDULE — XL

LOCATION: ELECTRICAL 205 | FED FROM: ATS-X

100 AMP MCB | 120/208 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 42 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	20 A	1	EGRESS LIGHTING	0.6	0.8					EGRESS LIGHTING	1	20 A	2
3	20 A	1	EXTERIOR EGRESS LIGHTING VIA LCP			0.7	0.7			EXTERIOR EGRESS LIGHTING VIA LCP	1	20 A	4
5	20 A	1	EGRESS LIGHTING					0.2	0.3	SECURITY AREA LIGHTING	1	20 A	6
7	20 A	1	SECURITY LOCKS EAST SIDE	0.6	0.5					SECURITY LOCKS WEST SIDE	1	20 A	8
9	20 A	1	FACP			0.5	0.0			SPARE	1	20 A	10
11	20 A	1	SPARE					0.0	0.0	SPARE	1	20 A	12
13	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	14
15	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	16
17	20 A	1	SPARE					0.0	--	SPACE ONLY	1	--	18
19	--	1	SPACE ONLY	--	--					SPACE ONLY	1	--	20
21	--	1	SPACE ONLY			--	--			SPACE ONLY	1	--	22
23	--	1	SPACE ONLY					--	--	SPACE ONLY	1	--	24
25	--	1	SPACE ONLY	--	0.0								26
27	60 A	2	PBD GP			3.6	0.0			SPD	3	30 A	28
29								3.6	0.0				30
				2 kVA		5 kVA		4 kVA					
				21 A		48 A		37 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 PROVIDE DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8.PROVIDE DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	2884 VA	125.00%	3605 VA
EXTERIOR LIGHTING	490 VA	125.00%	613 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	0 VA	0.00%	0 VA
ELECTRIC HEAT	0 VA	0.00%	0 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	8700 VA	100.00%	8700 VA

Panel Totals

Total Conn. Load: 12.1 kVA
Total Est. Demand: 12.9 kVA
Total Conn. Current: 34 A
Total Est. Demand Current: 36 A

PANELBOARD SCHEDULE — L2

LOCATION: ELECTRICAL 205 | FED FROM: EDP

225 AMP MLO | 120/208 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 22 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	20 A	1	REC RM 203, 204	0.9	0.8					INTERIOR LIGHTING & F-6	1	20 A	2
3	20 A	1	REC RM 204			1.1	1.4			WASHER RM 202	1	20 A	4
5	20 A	1	SPARE					0.0	0.2	COFFEE MACHINE RM 200	1	20 A	6
7	20 A	1	SPARE	0.0	2.2								8
9	20 A	1	REC RM 201			1.4	2.2			DRYER RM 202	2	30 A	10
11	20 A	1	REC STAIR & RM 206, 207					0.7	0.2	REC RM 200	1	20 A	12
13	20 A	1	REC RM 201	0.7	0.2					DEHUMIDIFIER - RM 148B	1	20 A	14
15	20 A	1	SERVER RACK RM 201			0.7	--			SPACE ONLY	1	--	16
17	20 A	1	REC RM 201					0.7	0.7	REC RM 201	1	20 A	18
19	30 A	2	SERVER RACK RM 201	1.5	1.4					REC RM 201	1	20 A	20
21						1.5	0.7			SERVER RACK RM 201	1	20 A	22
23	20 A	1	OVERHEAD DOOR RM 146					1.2	1.5	SERVER RACK RM 201	2	30 A	24
25	20 A	1	OVERHEAD DOOR RM 146	1.2	1.5								26
27	20 A	1	ROOF REC			0.9	0.6			SITE GATE	2	20 A	28
29	20 A	2	SITE GATE					0.9	0.6				30
31				0.9	0.6					SITE GATE	2	20 A	32
33	20 A	2	SITE GATE			0.9	0.6						34
35								0.9	0.0	SPARE	1	20 A	36
37	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	38
39	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	40
41	20 A	1	SPARE					0.0	0.0	SPARE	1	20 A	42
43	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	44
45	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	46
47	20 A	1	SPARE					0.0	0.0	SPARE	1	20 A	48
49	20 A	1	SPARE	0.0	0.0					SPARE	1	20 A	50
51	20 A	1	SPARE			0.0	0.0			SPARE	1	20 A	52
53	--	1	SPACE ONLY					--	--	SPACE ONLY	1	--	54
55	--	1	SPACE ONLY	--	--					SPACE ONLY	1	--	56
57	--	1	SPACE ONLY			--	--			SPACE ONLY	1	--	58
59	--	1	SPACE ONLY					--	--	SPACE ONLY	1	--	60
61	--	1	SPACE ONLY	--	--					SPACE ONLY	1	--	62
63	--	1	SPACE ONLY			--	--			SPACE ONLY	1	--	64
65	--	1	SPACE ONLY					--	--	SPACE ONLY	1	--	66
				12 kVA		12 kVA		8 kVA					
				105 A		106 A		63 A					

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(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8.PROVIDE DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	724 VA	125.00%	905 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	4140 VA	100.00%	4140 VA
AC / HEAT PUMP	113 VA	100.00%	113 VA
ELECTRIC HEAT	0 VA	0.00%	0 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	26580 VA	100.00%	26580 VA

Panel Totals

Total Conn. Load: 31.6 kVA
Total Est. Demand: 31.7 kVA
Total Conn. Current: 88 A
Total Est. Demand Current: 88 A

PANELBOARD SCHEDULE — LM

LOCATION: ELECTRICAL 205 | FED FROM: EDP

600 AMP MLO | 120/208 Wye | 3 PH 4 W | MOUNT: SURFACE | PANEL ASSEMBLY RATED (KAIC): 22 KAIC

CKT	BRKR	POLE	LOAD	A		B		C		LOAD	POLE	BRKR	CKT
1	15 A	1	F-2	0.1	1.0					TU1-05	1	15 A	2
3	20 A	1	GWH-1 & 2			17.4	0.1			F-4	1	15 A	4
5	15 A	1	TU1-11					1.0	8.7	RCP-1	1	15 A	6
7	25 A	1	TU1-04	2.0	1.5					TU1-10	1	20 A	8
9	15 A	1	TU1-14			1.0	0.1			F-7	1	15 A	10
11								1.9	2.2				12
13	20 A	3	TU1-12	1.9	2.2					TU1-01	3	25 A	14
15						1.9	2.2						16
17	20 A	2	SSO-1					1.7	2.4				18
19				1.7	2.4					TU1-02	3	25 A	20
21	20 A	1	EPO- RM 152			0.1	2.4						22
23	15 A	1	F-5					0.1	3.0	TU1-16	1	35 A	24
25	15 A	1	F-3	0.1	1.0					TU1-13	1	15 A	26
27	25 A	2	TU1-06			2.1	8.7			MOTORIZED DAMPER RM 152	1	20 A	28
29								2.1	2.1	TU1-08	2	25 A	30
31	25 A	2	TU1-03	2.1	2.1								32
33						2.1	1.9						34
35	20 A	2	TU1-15					1.3	1.9	TU1-07	3	20 A	36
37				1.3	1.9								38
39	15 A	1	F-8			0.1	1.9						40
41								2.2	1.9	TU1-19	3	25 A	42
43	25 A	3	TU1-09	2.2	1.9								44
45						2.2	2.9						46
47	20 A	2	EUH-1					1.7	2.9	DBP-1	3	50 A	48
49				1.7	2.9								50
51	15 A	1	TU1-17			1.0	1.0			TU1-18	1	15 A	52
53	20 A	2	EUH-2					1.7	--	SPACE ONLY	1	--	54
55				1.7	--					SPACE ONLY	1	--	56
57	--	1	SPACE ONLY			--	--			SPACE ONLY	1	--	58
59	--	1	SPACE ONLY					--	--	SPACE ONLY	1	--	60
61	--	1	SPACE ONLY	--	--					SPACE ONLY	1	--	62
63	--	1	SPACE ONLY			--	--			SPACE ONLY	1	--	64
65	--	1	SPACE ONLY					--	--	SPACE ONLY	1	--	66
67	--	1	SPACE ONLY	--	--					SPACE ONLY	1	--	68
69	--	1	SPACE ONLY			--	--			SPACE ONLY	1	--	70
71	--	1	SPACE ONLY					--	--	SPACE ONLY	1	--	72
				31 kVA		49 kVA		38 kVA					
				258 A		418 A		326 A					

(GE) = PROVIDE GFCI BREAKER FOR EQUIPMENT, 6-50mA PER NEC 427.22 PROVIDE DED. NEUTRAL.
(GP) = PROVIDE GFCI BREAKER FOR PERSONNEL, 4-6mA PER NEC 210.8.PROVIDE DED. NEUTRAL.
(L) = PROVIDE LOCKOUT BREAKER TO PREVENT UNAUTHORIZED SWITCHING.
(LC) = ROUTE TO LOAD VIA LIGHTING CONTACTOR.
(ML) = PROVIDE BREAKER WITH MAINTENANCE LOCKOUT, LOCKABLE OFF.

Load Classification	Connected Load	Demand Factor	Estimated Demand
INTERIOR LIGHTING	0 VA	0.00%	0 VA
EXTERIOR LIGHTING	0 VA	0.00%	0 VA
RECEPTACLES	0 VA	0.00%	0 VA
AC / HEAT PUMP	108744 VA	100.00%	108744 VA
ELECTRIC HEAT	6600 VA	100.00%	6600 VA
KITCHEN	0 VA	0.00%	0 VA
MISCELLANEOUS	780 VA	100.00%	780 VA

Panel Totals

Total Conn. Load: 117.9 kVA
Total Est. Demand: 117.9 kVA
Total Conn. Current: 327 A
Total Est. Demand Current: 327 A

Moseley
3200 NORFOLK STREET. RICHMOND, VA 23230
PHONE (804) 794-7555
MOSELEYDESIGNS.COM

COMMONWEALTH OF VIRGINIA
BRIAN C. WELLS
Lic. No. 046269
10-21-26
PROFESSIONAL ENGINEER

SOUTH HILL NEW POLICE STATION

TOWN OF SOUTH HILL
111 E. DANVILLE STREET, SOUTH HILL, VA 23970

PROJECT NO: 651033 | DATE: OCTOBER 21, 2026
SUBMITTAL: BID SET

REVISIONS	
DATE	DESCRIPTION

PANELBOARD SCHEDULES

E7.1

10/21/2026 11:18:25 AM