

# S P E C I F I C A T I O N S

## Security Screening Centers

State House and Burton M. Cross Office Building  
Augusta, Maine

BGS Project No. 3676

### Prepared For:

**State of Maine**  
**Bureau of General Services**  
Division of Planning, Design & Construction  
77 State House Station  
Augusta, Maine 04333

**January 2, 2025**

### Prepared By:



**OAK POINT**  
A S S O C I A T E S

architecture  
engineering  
planning

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

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END

**00 11 13**  
**Notice to Contractors**

**Cross Building and State House Security Screening Centers**  
 BGS project number:3676

*The project consists of demolition of existing capital police offices and adjacent spaces, and construction of new offices at the existing cafeteria annex. A new steel-framed entry vestibule with granite Veneer and new internal screening area. All associated site work, mechanical, plumbing, sprinkler, and electrical is included in the project scope.*

*Renovations on the State House side to include selective demolition of the café space and work associated with room becoming the new screening area.*

The contract shall designate the Substantial Completion Date on or before *30 June 2025 for the Capital Police Offices, and 15 December 2025 for the two Security Screening areas*, and the Contract Final Completion Date on or before *15 January 2026*.

1. Submit bids on a completed Contractor Bid Form (section 00 41 13), provided in the Bid Documents, include bid security when required, and scan each item as an attachment to an email addressed to: BGS.Architect@Maine.gov, so as to be received no later than **2:00:00 p.m. on 30 January 2025**. The email subject line shall be marked "**Bid for Cross Building and State House Security Screening Centers**".

Bid submissions will be opened and read aloud at the time and date noted above at the Bureau of General Services office, accessible as a video conference call. Those who wish to participate in the call must submit a request for access to BGS.Architect@Maine.gov.

Any bid received after the noted time will not be considered a valid bid and will remain unopened. Any bid submitted by any other means will not be considered a valid bid. In certain circumstances, the Bureau of General Services may require the Bidder to surrender a valid paper copy of the bid form or the bid security document. The Owner reserves the right to accept or reject any or all bids as may best serve the interest of the Owner.

2. Questions and comments on the *bid opening process* shall be addressed to: Division of Planning, Design & Construction, Bureau of General Services, 77 State House Station, Augusta, Maine 04333-0077, BGS.Architect@Maine.gov.
3. Questions and comments regarding the *project* design specifications or drawings shall be directed in writing to the Consultant during the bid period prior to the question and comment deadline of 5:00 p.m. on *20 January 2025*.

*Oak Point Associates  
 Leah Schaffer  
 lschaffer@oakpoint.com*

**00 11 13**  
**Notice to Contractors**

4. ☒ Bid security is required on this project.  
 The Bidder shall include a satisfactory Bid Bond (section 00 43 13) or a certified or cashier's check for 5% of the bid amount with the completed bid form submitted to the Owner. The Bid Bond form is available on the BGS website.  
*or*  
☐ Bid security is not required on this project.
5. ☒ Performance and Payment Bonds are required on this project.  
 If noted above as required, or if any combination of Base Bid and Alternate Bids amounts selected in the award of the contract exceeds \$125,000.00, the selected Contractor shall furnish a 100% contract Performance Bond (section 00 61 13.13) and a 100% contract Payment Bond (section 00 61 13.16) in the contract amount to cover the execution of the Work. Bond forms are available on the BGS website.  
*or*  
☐ Performance and Payment Bonds are not required on this project.
6. Filed Sub-bids *are not required* on this project.
7. ☐ Pre-qualified General Contractors are utilized on this project.  
*insert the company name, city and state for each*  
*or*  
☒ Pre-qualified General Contractors are not utilized on this project.
8. ☒ An on-site pre-bid conference ( ☒ *mandatory* or ☐ *optional* ) will be conducted for this project.  
 The pre-bid conference is intended for General Contractors. Subcontractors and suppliers are welcome to attend. Contractors who arrive late or leave early for a mandatory meeting may be prohibited from participating in this meeting and bidding.  
*Meeting will take place at the Cross Office Building on January 14, 2025 at 9a.m. The meeting will be in Room 102 at the North end of the first floor.*  
*or*  
☐ An on-site pre-bid conference will not be conducted for this project.
9. Bid Documents - full sets only - will be available on or about *2 January 2025* and may be obtained *at a cost* from:  
*Xpress Copy*  
*17 Westfield Street*  
*Portland, ME 04102*  
*1-207-775-244 (www.xcopy.com)*

**00 11 13**  
**Notice to Contractors**

10. Bid Documents may be examined at:

*AGC Maine*

*188 Whitten Road, Augusta, ME 04330*

*207-622-4741*

*Construction Summary*

*734 Chestnut Street, Manchester, NH 03104*

*603-627-8856*

**00 21 13**  
**Instructions to Bidders**

**1. Bidder Requirements**

- 1.1 A bidder is a Contractor which is evidently qualified, or has been specifically pre-qualified by the Bureau of General Services, to bid on the proposed project described in the Bid Documents.
- 1.2 Contractors and Subcontractors bidding on projects that utilize Filed Sub-bids shall follow the requirements outlined in these Bid Documents for such projects. See Section 00 22 13 for additional information.
- 1.3 Contractors and Subcontractors are not eligible to bid on the project when their access to project design documents prior to the bid period distribution of documents creates an unfair bidding advantage. Prohibited access includes consultation with the Owner or with design professionals engaged by the Owner regarding cost estimating, constructability review, or project scheduling. This prohibition to bid applies to open, competitive bidding or pre-qualified contractor bidding or Filed Sub-bidding. The Bureau may require additional information to determine if the activities of a Contractor constitute an unfair bidding advantage.
- 1.4 Each bidder is responsible for becoming thoroughly familiar with the Bid Documents prior to submitting a bid. The failure of a bidder to review evident site conditions, to attend available pre-bid conferences, or to receive, examine, or act on addenda to the Bid Documents shall not relieve that bidder from any obligation with respect to their bid or the execution of the work as a Contractor.
- 1.5 Prior to the award of the contract, General Contractor bidders or Filed Sub-bidders may be required to provide documented evidence to the Owner or the Bureau showing compliance with the provisions of this section, their business experience, financial capability, or performance on previous projects.
- 1.6 The selected General Contractor bidder will be required to provide proof of insurance before a contract can be executed.
- 1.7 Contracts developed from this bid shall not be assigned, sublet or transferred without the written consent of the Owner.
- 1.8 By submitting a bid the Contractor attests that it has not been declared ineligible to bid on State of Maine projects. The Director of the Bureau of General Services may disallow award of this contract to any Contractor if there is evidence that the Contractor or any of its Subcontractors, through their own fault, have been terminated, suspended for cause, debarred from bidding, agreed to refrain from bidding as part of a settlement, have defaulted on a contract, or had a contract completed by another party.
- 1.9 The Contractor attests that it is not presently indicted for or otherwise criminally or civilly charged by a Federal, State or local government entity with commission of any of the following offenses and has not within a three-year period preceding this bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction, or contract under a public transaction, violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

**00 21 13**  
**Instructions to Bidders**

- 1.10 The Contractor shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs or State of Maine projects.
  
2. Authority of Owner
  - 2.1 The Owner reserves the right to accept or reject any or all bids as may best serve the interest of the Owner.
  
  - 2.2 Subject to the Owner's stated right to accept or reject any or all bids, the Contractor shall be selected on the basis of the lowest dollar value of an acceptable Base Bid, or any combination of Base Bid plus Alternate Bids, as well as other limited cost modifications the Owner determines may best serve the interests of the Owner. An acceptable bid is a duly submitted bid from a responsive and responsible bidder.
  
  - 2.3 The Owner reserves the right to require Bid Bonds or Performance and Payment Bonds for any project of any contract value.
  
3. Submitting Bids and Bid Requirements
  - 3.1 Each bid shall be submitted on the forms provided in the Bid Documents.
  
  - 3.2 Each bid shall be valid for a period of thirty calendar days following the Project bid closing date and time. The bid expiration date may be extended in unusual circumstances by mutual consent of the Bidder and the Owner. The bid amount shall not be modified due to the bid expiration date extension.
  
  - 3.3 Any provision contained in a bid which shows cost escalation, or any modification of schedule or other requirements shall not be accepted. Such a provision causes the bid to be invalid, or, at the discretion of the Owner and BGS, that element of the bid submission may be disregarded for the purpose of awarding the contract without that provision.
  
  - 3.4 Bidders shall include a Bid Bond or other approved bid security with the bid form submitted to the Owner when the bid form indicates such bid security is required. The bond value shall be 5% of the bid amount. The form of bond is shown in section 00 43 13.
  
  - 3.5 Bidders recognize that inclusion of contract bonds and the cost of those bonds is dependent on the awarded contract dollar value. Therefore, a Base Bid, or any combination of Base Bid plus Alternate Bids, as well as other limited cost modifications, resulting in a contract award shall include the cost of Performance and Payment Bonds in the submitted bid amount when the construction contract value is over \$125,000.00. Similarly, the cost of Performance and Payment Bonds is excluded in the submitted bid amount when the construction contract value is \$125,000.00 or less unless bonds are specifically required by the Bid Documents. When required for the project, the selected Contractor shall provide these bonds before a contract can be executed, pursuant to 14 M.R.S.A., Section 871, Public Works Contractors' Surety Bond Law of 1971, subsection 3. The form of bonds is shown in section 00 61 13.13 and 00 61 13.16.

**00 21 13**  
**Instructions to Bidders**

- 3.6 Bidders may modify bids in writing, by the same means as the original bid submission, prior to the bid closing time. Such written amendments shall not disclose the amount of the initial bid. If so disclosed, the entire bid is considered invalid.
- 3.7 Bidders implicitly acknowledge all Addenda issued when they submit the bid form. By usual practice the Consultant shall not issue Addenda less than 72 hours prior to the bid closing time, to allow ample time for bidders to incorporate the information. However, some information, such as extending the bid due date and time, may be issued with shorter notice. Addenda shall be issued to all companies who are registered holders of Bid Documents.
- 3.8 A bid may be withdrawn without penalty if a written request by the bidder is presented to the Owner prior to the bid closing time. Such written withdrawal requests are subject to verification as required by the Bureau.
- A bid may be withdrawn without penalty after the bid closing time if, in the determination of the Bureau, evidence provided by the Contractor shows an apparent unintended error such as a miscalculation, or an erroneous number on estimating documents, was the cause of an inaccurate bid. The Bureau may allow withdrawal in consideration of the bid bond or, without utilizing a bid bond, if the Bureau considers documented evidence provided by the Contractor shows factual errors had been made on the bid form.
- 3.9 In the event State of Maine Offices unexpectedly close on the published date of a public bid opening in the location of that bid opening, prior to the time of the scheduled deadline, the new deadline for the public bid opening will be the following business day at the originally scheduled hour of the day, at the original location. Official closings are posted on the State of Maine government website.
- 3.10 The Owner may require, in a Notice of Intent to Award letter to the apparent low bidder, a Schedule of Values, Project Schedule, and List of Subcontractors and Suppliers as both a demonstration of capability of the Bidder and as a condition of award.
- 3.11 Projects which require a State of Maine wage determination will include that schedule as part of the Bid Documents. See section 00 73 46, if such rates are required.
- 3.12 Projects which require compliance with the Davis-Bacon Act are subject to the regulations contained the Code for Federal Regulations and the federal wage determination which is made a part of the Bid Documents. See section 00 73 46, if such rates are required.
- 3.13 The Owner is exempt from the payment of Maine State sales and use taxes as provided in 36 M.R.S. §1760 (1). The Contractor and Subcontractors shall not include taxes on exempt items in the construction contract.



SECURITY SCREENING ADDITION  
BURTON M. CROSS BUILDING  
AUGUSTA, MAINE

DOCUMENT 003119 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Existing Drawings that include information on existing conditions, including previous construction at Project site are available for viewing at the office of Owner.
- C. Related Requirements:
  - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
  - 2. Section 312000 "Earth Moving" for reports and soil-boring data from geotechnical investigations that are made available to Bidders.
  - 3. Document 002513 "Prebid Meetings" for site walkthrough.

END OF DOCUMENT

**00 41 13**  
**Contractor Bid Form**

**Cross Building and State House Security Screening Centers**  
 BGS project number: 3676

Bid Form submitted by: *email only to email address below*

Bid Administrator:

*John Kenney*

BGS.Architect@Maine.gov

Bureau of General Services

111 Sewall Street, Cross State Office Building, 4th floor

77 State House Station

Augusta, Maine 04333-0077

Bidder:

Signature: \_\_\_\_\_

Printed name and  
title: \_\_\_\_\_

Company name: \_\_\_\_\_

Mailing address: \_\_\_\_\_

City, state, zip code: \_\_\_\_\_

Phone number: \_\_\_\_\_

Email address: \_\_\_\_\_

State of  
incorporation,  
if a corporation: \_\_\_\_\_

List of all partners,  
if a partnership: \_\_\_\_\_

The Bidder agrees, if the Owner offers to award the contract, to provide any and all bonds and certificates of insurance, as well as Schedule of Values, Project Schedule, and List of Subcontractors and Suppliers if required by the Owner, and to sign the designated Construction Contract within twelve calendar days after the date of notification of such acceptance, except if the twelfth day falls on a State of Maine government holiday or other closure day, or a Saturday, or a Sunday, in which case the aforementioned documents must be received before 12:00 noon on the first available business day following the holiday, other closure day, Saturday, or Sunday.

As a guarantee thereof, the Bidder submits, together with this bid, a bid bond or other acceptable instrument as and if required by the Bid Documents.

**00 41 13**  
**Contractor Bid Form**

1. The Bidder, having carefully examined the Cross Building and State House Security Screening Centers Project Manual dated January 2, 2025, prepared by Oak Point Associates, as well as Specifications, Drawings, and any Addenda, the form of contract, and the premises and conditions relating to the work, proposes to furnish all labor, equipment and materials necessary for and reasonably incidental to the construction and completion of this project for the **Base Bid** amount of:

\$ \_\_\_\_\_ .00

2. Allowances *are included* on this project.  
*Bid amount above includes the following Allowances*

1 Allowance No. 1: Granite Stone Panels \$ 65,000.00

2 Allowance No. 2: Existing Windows Flashing and Sealant Repair \$ 8,000.00

3 Not used \$ 0.00

3. Alternate Bids *are included* on this project.  
*Alternate Bids are as shown below*  
 Any dollar amount line below that is left blank by the Bidder shall be read as a bid of **\$0.00**.

1 Alternate 1: Entry Display Case \$ \_\_\_\_\_ 0.00

2 Not used \$ \_\_\_\_\_ 0.00

3 Not used \$ \_\_\_\_\_ 0.00

4. Unit Prices *are included* on this project.  
*Alternate Bids are as shown below*  
 Any dollar amount line below that is left blank by the Bidder shall be read as a bid of **\$0.00**. **Note:**  
**ADD and DEDUCT unit prices cannot differ by more than 20%.**

|  | UNIT      | ADD      | DEDUCT   |
|--|-----------|----------|----------|
| 1 Unit Price No. 1: Granite stone panels | <u>sf</u> | \$ _____ | \$ _____ |
| 2 Unit Price No. 2: Steel Piles          | <u>ft</u> | \$ _____ | \$ _____ |

**00 41 13**  
**Contractor Bid Form**

3 *Not used*

xx

\$ \_\_\_\_\_

\$ \_\_\_\_\_

5. Bid security *is required* on this project.

If noted above as required, or if the Base Bid amount exceeds \$125,000.00, the Bidder shall include with this bid form a satisfactory Bid Bond (section 00 43 13) or a certified or cashier's check for 5% of the bid amount with this completed bid form submitted to the Owner.

6. Filed Sub-bids *are required* on this project.

If noted above as required, the Bidder shall include with this bid form a list of each Filed Sub-bidder selected by the Bidder on the form provided (section 00 41 13F).

**00 43 13**  
**Contractor Bid Bond**

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of five percent of the bid amount, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns, signed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the first specified bid due date, or subsequent bid due date revised by addendum.

The condition of the above obligation is such that whereas the principal has submitted to the Owner, or State of Maine, to a certain bid, attached hereto and hereby made a part hereof, to enter into a contract in writing, for the construction of Cross Building and State House Security Screening Centers.

Now therefore:

If said bid shall be rejected, or, in the alternate,

If said bid shall be accepted and the principal shall execute and deliver a contract in the form of contract attached hereto, properly completed in accordance with said bid, and shall furnish a bond for the faithful performance of said contract, and for the payment of all persons performing labor or furnishing material in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said bid, then this obligation shall be void.

Otherwise, the same shall remain in force and effect- it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time within which the Obligee may accept such bid and said Surety does hereby waive notice of any such extension.

**00 43 13**  
**Contractor Bid Bond**

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the first specified bid due date, or subsequent bid due date revised by addendum.

**Contractor**

\_\_\_\_\_  
(Signature)

*insert name and title*

*insert company name*

*insert address*  
*insert city state zip code*

**Surety**

\_\_\_\_\_  
(Signature)

*insert name and title*

*insert company name*

*insert address*  
*insert city state zip code*

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

## State of Maine CONSTRUCTION CONTRACT

### Large Construction Project

*This form is used when the Contract value is \$50,000 or greater.  
The Project Manual, Specifications and Drawings, and any Addenda are considered part of this Contract.*

Agreement entered into by and between the contracting entity name hereinafter called the **Owner** and Contractor company name hereinafter called the **Contractor**.

BGS Project No.: number assigned by BGS

Other Project No.: \_\_\_\_\_

For the following Project: Cross Building and State House Security Screening Centers at the State House and Burton M. Cross Office Building, Augusta, Maine.

The Specifications and the Drawings have been prepared by Consultant firm name, acting as Professional-of-Record and named in the documents as the Consultant Architect or Engineer.

The *Owner* and *Contractor* agree as follows:

#### ARTICLE 1 COMPENSATION AND PAYMENTS

**1.1** The Owner shall pay the Contractor to furnish all labor, equipment, materials and incidentals necessary for the construction of the Work described in the Specifications and shown on the Drawings the Contract Amount as shown below.

|   |                      |
|---|----------------------|
| Base Bid  | <u>\$0.00</u>        |
| <u>Alternate Bid number and name or "no Alternates"</u> | <u>\$0.00</u>        |
| <u>Alternate Bid number and name or "no Alternates"</u> | <u>\$0.00</u>        |
| <u>Alternate Bid number and name or "no Alternates"</u> | <u>\$0.00</u>        |
| <u>Alternate Bid number and name or "no Alternates"</u> | <u>\$0.00</u>        |
| <u>Alternate Bid number and name or "no Alternates"</u> | <u>\$0.00</u>        |
| <b>Total Contract Amount</b>                            | <b><u>\$0.00</u></b> |

**1.2** The Contractor's requisition shall contain sufficient detail and supporting information for the Owner to evaluate and support the payment requested.

**1.2.1** Payments are due and payable twenty-five working days from the date of receipt of a Contractor requisition which is approved by the Owner.

**1.2.2** Provisions for late payments are governed by 5 M.R.S. Chapter 144, *Payment of Invoices Received from Business Concerns*, and interest shall be calculated at 1% per month.

#### ARTICLE 2 COMMENCEMENT AND COMPLETION DATES

**2.1** The Work of this Contract shall commence no sooner than the date this document is executed by the approval authority, or a subsequent date designated in the contract documents.

**2.2** The Substantial Completion Date shall be \_\_\_\_\_.

**2.3** The Work of this Contract shall be completed on or before the Contract Final Completion Date of \_\_\_\_\_.

**2.4** The Contract Expiration Date shall be \_\_\_\_\_. (This date is the Owner's deadline for internal management of contract accounts. The Contract Expiration Date does not directly relate to any contract obligation of the Contractor.)

### **ARTICLE 3 INELIGIBLE BIDDER**

**3.1** By signing this contract the Contractor attests that it has not been declared ineligible to bid on State of Maine projects. The Bureau of General Services may disallow award of this contract to any Contractor if there is evidence that the Contractor or any of its Subcontractors, through their own fault, have been terminated, suspended for cause, debarred from bidding, agreed to refrain from bidding as part of a settlement, have defaulted on a contract, or had a contract completed by another party.

**3.2** By signing this contract the Contractor attests that it is not presently indicted for or otherwise criminally or civilly charged by a Federal, State or local government entity with commission of any of the following offenses and has not within a three-year period preceding this bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction, or contract under a public transaction, violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

**3.3** The Contractor shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs or State of Maine projects.

### **ARTICLE 4 CONTRACTOR'S RESPONSIBILITIES**

**4.1** On this project, the Contractor shall furnish the Owner the appropriate contract bonds in the amount of 100% of the Contract Sum. Contract bonds are mandated if the Contract Sum exceeds \$125,000, or if bonds are specifically required by the Contract Documents.

**4.2** The Contractor shall comply with all laws, codes and regulations applicable to the Work.

**4.3** The Contractor shall acquire all permits and third-party approvals applicable to the Work not specifically identified as provided by the Owner. Costs for Contractor-provided permits and third-party approvals shall be included in the Contract Sum identified in Section 1.1 above.

**4.4** The Contractor shall remain an independent agent for the duration of this Contract, shall not become an employee of the State of Maine, and shall assure that no State employee will be compensated by, or otherwise benefit from, this Contract.

**4.5** The Contractor shall be responsible for any design cost, construction cost, or other cost incurred on the Project to the extent caused by the negligent acts, errors or omissions of the Contractor or their Subcontractors in the performance of Work under this Contract.



**ARTICLE 5 OWNER'S RESPONSIBILITIES**

**5.1** The Owner shall provide full information about the objectives, schedule, constraints and existing conditions of the project. The Owner has established a budget with reasonable contingencies that meets the project requirements.

**5.2** By signing this contract, the Owner attests that all State of Maine procurement requirements for this contract have been met, including the solicitation of competitive bids.

**ARTICLE 6 INSTRUMENTS OF SERVICE**

**6.1** The Contractor's use of the drawings, specifications and other documents known as the Consultant's Instruments of Service is limited to the execution of the Contractor's scope of work of this project unless the Contractor receives the written consent of the Owner and Consultant for use elsewhere.

**ARTICLE 7 MISCELLANEOUS PROVISIONS**

**7.1** This Contract shall be governed by the laws of the State of Maine.

**7.2** The Owner and Contractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to this Contract. Neither party to this Contract shall assign the Contract as a whole without written consent of the other party, which consent the Owner may withhold without cause.

**7.3** Notwithstanding any other provision of this Agreement, if the Owner does not receive sufficient funds to fund this Agreement or funds are de-appropriated, or if the Owner does not receive legal authority from the Maine State Legislature or Maine Courts to expend funds intended for this Agreement, then the Owner is not obligated to make payment under this Agreement; provided, however, the Owner shall be obligated to pay for services satisfactorily performed prior to any such non-appropriation in accordance with the termination provisions of this Agreement. The Owner shall timely notify the Contractor of any non-appropriation and the effective date of the non-appropriation.

**ARTICLE 8 CONTRACT DOCUMENTS**

**8.1** The Project Manual, Specifications and Drawings, and any Addenda, together with this agreement, form the contract. Each element is as fully a part of the Contract as if hereto attached or herein repeated.

**8.2** Specifications: *indicate date of issuance of project manual*

**8.3** Drawings: *note here or attach each sheet number and title*

**8.4** Addenda: *note each addenda number and date, or "none"*

BGS Project No.: \_\_\_\_\_

The Contract is effective as of the date executed by the approval authority.

**OWNER****CONTRACTOR**

\_\_\_\_\_  
*Signature Date*  
*name and title*

*name of contracting entity*  
*address*

*telephone*  
*email address*

\_\_\_\_\_  
*Signature Date*  
*name and title*

*name of contractor company*  
*address*

*telephone*  
*email address*  
*Vendor Number*

*Indicate the names of the review and approval individuals appropriate to the approval authority.*

|  |  |  |  |
|--|--|--|--|
| <b>select proper approval authority</b>              |  |  |  |
| <b>Reviewed by:</b>                                  |  | <b>Approved by:</b>  |  |
| _____<br><i>Signature Date</i><br><i>insert name</i> |  | _____<br><i>Signature Date</i><br><i>Joseph H. Ostwald</i> |  |
| <i>Project Manager/ Contract Administrator</i>       |  | <i>Director, Planning, Design &amp; Construction</i>       |  |

**00 61 13.13**  
**Contractor Performance Bond**

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly and faithfully perform the contract entered into this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of Cross Building and State House Security Screening Centers, then this obligation shall be null and void.

Otherwise, the same shall remain in force and effect- it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

**00 61 13.13**  
**Contractor Performance Bond**

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

**Contractor**

\_\_\_\_\_  
(Signature)

*insert name and title*

*insert company name*

*insert address*

*insert city state zip code*

**Surety**

\_\_\_\_\_  
(Signature)

*insert name and title*

*insert company name*

*insert address*

*insert city state zip code*

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

**00 61 13.16**  
**Contractor Payment Bond**

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the use and benefit of claimants, defined as an entity having a contract with the principal or with a subcontractor of the principal for labor, materials, or both labor and materials, used or reasonably required for use in the performance of the contract, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly satisfy all claims and demands incurred for all labor and materials, used or required by the principal in connection with the work described in the contract entered into this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of Cross Building and State House Security Screening Centers, and shall fully reimburse the obligee for all outlay and expense with said obligee may incur in making good any default of said principal, then this obligation shall be null and void.

Otherwise, the same shall remain in force and effect- it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

**00 61 13.16**  
**Contractor Payment Bond**

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

**Contractor**

\_\_\_\_\_  
(Signature)

*insert name and title*

*insert company name*

*insert address*

*insert city state zip code*

**Surety**

\_\_\_\_\_  
(Signature)

*insert name and title*

*insert company name*

*insert address*

*insert city state zip code*

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

**00 71 00**  
**Definitions**

1. Definitions

- 1.1 *Addendum*: A document issued by the Consultant that amends the Bid Documents. Addenda shall not be issued less than seventy-two hours prior to the specified bid opening time.
- 1.2 *Allowance*: A specified dollar amount for a particular scope of work or service included in the Work that is identified in the Bid Documents and included in each Bidder's Bid. The Contractor shall document expenditures for an Allowance during the Project. Any unused balance shall be credited to the Owner. The Contractor is responsible for notifying the Owner of anticipated expenses greater than the specified amount and the Owner is responsible for those additional expenses.
- 1.3 *Alternate Bid*: The Contractor's written offer of a specified dollar amount, submitted on the Bid Form, for the performance of a particular scope of work described in the Bid Documents. The Owner determines the low bidder based on the sum of the base Bid and any combination of Alternate Bids that the Owner selects.
- 1.4 *Architect*: A Consultant acting as, or supporting, the Professional-of-Record who is responsible for the design of the Project. Equivalent to "Consultant" in State of Maine contract forms.
- 1.5 *Architectural Supplemental Instruction (ASI)*: A written instruction from the Architect for the purpose of clarification of the Contract Documents. An ASI does not alter the Contract Price or Contract Time. ASIs may be responses to RFIs and shall be issued by the Architect in a timely manner to avoid any negative impact on the Schedule of the Work.
- 1.6 *Bid*: The Contractor's written offer of a specified dollar amount or amounts, submitted on a form included in the Bid Documents, for the performance of the Work. A Bid may include bonds or other requirements. A base Bid is separate and distinct from Alternate Bids, being the only cost component necessary for the award of the contract, and representing the minimum amount of Work that is essential for the functioning of the Project.
- 1.7 *Bid Bond*: The security designated in the Bid Documents, furnished by Bidders as a guaranty of good faith to enter into a contract with the Owner, should a contract be awarded to that Bidder.
- 1.8 *Bidder*: Any business entity, individual or corporation that submits a bid for the performance of the work described in the Bid Documents, acting directly or through a duly authorized representative. See also *Responsive and Responsible Bidder*.
- 1.9 *Bid Documents*: The drawings, procurement and contracting requirements, general requirements, and the written specifications -including all addenda, that a bidder is required to reference in the submission of a bid.
- 1.10 *Bureau*: The State of Maine Bureau of General Services, or BGS, in the Department of Administrative and Financial Services.
- 1.11 *Calendar days*: Consecutive days, as occurring on a calendar, taking into account each day of the week, month, year, and any religious, national or local holidays. Calendar days are used for changes in Contract Time.

**00 71 00**  
**Definitions**

- 1.12 *Certificate of Substantial Completion*: A document developed by the Consultant that describes the final status of the Work and establishes the date that the Owner may use the facility for its intended purpose. The Certificate of Substantial Completion may also include a provisional list of items - a "punch list" - remaining to be completed by the Contractor. The Certificate of Substantial Completion identifies the date from which the project warranty period commences.
- 1.13 *Certificate of Occupancy*: A document developed by a local jurisdiction such as the Code Enforcement Officer that grants permission to the Owner to occupy a building.
- 1.14 *Change Order (CO)*: A document that modifies the contract and establishes the basis of a specific adjustment to the Contract Price or the Contract Time, or both. Change Orders may address correction of omissions, errors, and document discrepancies, or additional requirements. Change Orders should include all labor, materials and incidentals required to complete the work described. A Change Order is not valid until signed by the Contractor, Owner and Consultant and approved by the Bureau.
- 1.15 *Change Order Proposal (COP) (see also Proposal)*: Contract change proposed by the Contractor regarding the contract amount, requirements, or time. The Contractor implements the work of a COP after it is accepted by all parties. Accepted COPs are incorporated into the contract by Change Order.
- 1.16 *Clerk of the Works*: The authorized representative of the Consultant on the job site. Clerk of the Works is sometimes called the Architect's representative.
- 1.17 *Construction Change Directive (CCD)*: A written order prepared by the Consultant and signed by the Owner and Consultant, directing a change in the Work prior to final agreement with the Contractor on adjustment, if any, in the Contract Price or Contract Time, or both.
- 1.18 *Contract*: A written agreement between the Owner and the successful bidder which obligates the Contractor to perform the work specified in the Contract Documents and obligates the Owner to compensate the Contractor at the mutually accepted sum, rates or prices.
- 1.19 *Contract Bonds (also known as Payment and Performance Bonds)*: The approved forms of security, furnished by the Contractor and their surety, which guarantee the faithful performance of all the terms of the contract and the payment of all bills for labor, materials and equipment by the Contractor.
- 1.20 *Contract Documents*: The drawings and written specifications (including all addenda), Standard General Conditions, and the contract (including all Change Orders subsequently incorporated in the documents).
- 1.21 *Contract Expiration Date*: Date determined by the Owner as a deadline for internal management of contract accounts. This allows time after the Contract Final Completion Date for processing the final Requisition for Payment. The Contract Expiration Date does not directly relate to any contract obligation of the Contractor.
- 1.22 *Contract Final Completion Date*: Point of time when the Work is fully completed in compliance with the Contract Documents, as certified by the Consultant. Final payment to the Contractor is due upon Final Completion of the Project.
- 1.23 *Contract Price*: The dollar amount of the construction contract, also called *Contract Sum*.



**00 71 00**  
**Definitions**

- 1.24 *Contract Time*: The designated duration of time to execute the Work of the contract, with a specific date for completion.
- 1.25 *Contractor*: Also called the "General Contractor" or "GC" the individual or entity undertaking the execution of the general contract work under the terms of the contract with the Owner, acting directly or through a duly authorized representative. The Contractor is responsible for the means, methods and materials utilized in the execution and completion of the Work.
- 1.26 *Consultant*: The Architect or Engineer acting as Professional-of-Record for the Project. The Consultant is responsible for the design of the Project.
- 1.27 *Drawings*: The graphic and pictorial portion of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
- 1.28 *Engineer*: A Consultant acting as, or supporting, the Professional-of-Record who is responsible for the design of the Project. Equivalent to "Consultant" in State of Maine contract forms.
- 1.29 *Filed Sub-bid*: The designated major Subcontractor's (or, in some cases, Contractor's) written offer of a specified dollar amount or amounts, submitted on a form included in the Bid Documents, for the performance of a particular portion of the Work. A Filed Sub-bid may include bonds or other requirements.
- 1.30 *General Requirements*: The on-site overhead expense items the Contractor provides for the Project, typically including, but not limited to, building permits, construction supervision, Contract Bonds, insurance, field office, temporary utilities, rubbish removal, and site fencing. Overhead expenses of the Contractor's general operation are not included. Sometimes referred to as the Contractor's General Conditions.
- 1.31 *Owner*: The State agency which is represented by duly authorized individuals. The Owner is responsible for defining the scope of the Project and compensation to the Consultant and Contractor.
- 1.32 *Owner's Representative*: The individual or entity contracted by the Owner to be an advisor and information conduit regarding the Project.
- 1.33 *Overhead*: General and administrative expenses of the Contractor's principal and branch offices, including payroll costs and other compensation of Contractor employees, deductibles paid on any insurance policy, charges against the Contractor for delinquent payments, and costs related to the correction of defective work, and the Contractor's capital expenses, including interest on capital used for the work.
- 1.34 *Performance and Payment Bonds (also known as Contract Bonds)*: The approved forms of security, furnished by the Contractor and their surety, which guarantee the faithful performance of all the terms of the contract and the payment of all bills for labor, materials and equipment by the Contractor.
- 1.35 *Post-Bid Addendum*: Document issued by the Consultant that defines a potential Change Order prior to signing of the construction contract. The Post-Bid Addendum allows the Owner to negotiate

## 00 71 00 Definitions

contract changes with the Bidder submitting the lowest valid bid, only if the negotiated changes to the Bid Documents result in no change or no increase in the bid price.

A Post-Bid Addendum may also be issued after a competitive construction Bid opening to those Bidders who submitted a Bid initially, for the purpose of rebidding the Project work without re-advertising.

- 1.36 *Project*: The construction project proposed by the Owner to be constructed according to the Contract Documents. The Project, a public improvement, may be tied logistically to other public improvements and other activities conducted by the Owner or other contractors.
- 1.37 *Proposal (see also Change Order Proposal)*: The Contractor's written offer submitted to the Owner for consideration containing a specified dollar amount or rate, for a specific scope of work, and including a schedule impact, if any. A proposal shall include all costs for overhead and profit. The Contractor implements the work of a Proposal after it is accepted by all parties. Accepted Proposals are incorporated into the contract by Change Order.
- 1.38 *Proposal Request (PR)*: An Owner's written request to the Contractor for a Change Order Proposal.
- 1.39 *Punch List*: A document that identifies the items of work remaining to be done by the Contractor at the Close Out of a Project. The Punch List is created as a result of a final inspection of the work only after the Contractor attests that all of the Work is in its complete and permanent status.
- 1.40 *Request For Information (RFI)*: A Contractor's written request to the Consultant for clarification, definition or description of the Work. RFIs shall be presented by the Contractor in a timely manner to avoid any negative impact on the Schedule of the Work.
- 1.41 *Request For Proposal (RFP)*: An Owner's written request to the Contractor for a Change Order Proposal.
- 1.42 *Requisition for Payment*: The document in which the Contractor certifies that the Work described is, to the best of the Contractor's knowledge, information and belief, complete and that all previous payments have been paid by the Contractor to Subcontractors and suppliers, and that the current requested payment is now due. See *Schedule of Values*.
- 1.43 *Responsive and Responsible Bidder*: A bidder who complies, when submitting a bid on a given project, with the following *responsive* standards, as required by the Bid Documents:
  - submits specific qualifications to bid the project, if required;
  - attends mandatory pre-bid conferences, if required;
  - submits a bid prior to the close of the bid period;
  - submits a complete bid form;
  - submits a bid without indications of intent contrary to the stated requirements;
  - submits other materials and information, such as bid security, as required;
 and, meets the following minimums regarding these *responsible* standards:
  - sustains a satisfactory record of project performance;
  - maintains a permanent place of business in a known physical location;
  - possesses the financial means for short- and long-term operations;
  - possesses the appropriate technical experience and capabilities;
  - employs adequate personnel and subcontractor resources;

**00 71 00**  
**Definitions**

maintains the equipment needed to perform the work;  
 complies with the proposed implementation schedule;  
 complies with the insurance and bonding requirements;  
 provides post-construction warranty coverage;  
 and other criteria which can be considered relevant to the contract.

- 1.44 *Retainage*: The amount, calculated at five percent (5%) of the contract value or a scheduled value, that the Owner shall withhold from the Contractor until the work or portion of work is declared substantially complete or otherwise accepted by the Owner. The Owner may, if requested, reduce the amount withheld if the Owner deems it desirable and prudent to do so. (See Title 5 M.R.S.A., Section 1746.)
- 1.45 *Sample*: A physical example provided by the Contractor which illustrates materials, equipment or workmanship and establishes standards by which the Work will be judged.
- 1.46 *Schedule of the Work*: The document prepared by the Contractor and approved by the Owner that specifies the dates on which the Contractor plans to begin and complete various parts of the Work, including dates on which information and approvals are required from the Owner.
- 1.47 *Schedule of Values*: The document prepared by the Contractor and approved by the Owner before the commencement of the Work that specifies the dollar values of discrete portions of the Work equal in sum to the contract amount. The Schedule of Values is used to document progress payments of the Work in regular (usually monthly) requisitions for payment. See *Requisition for Payment*.
- 1.48 *Shop Drawings*: The drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- 1.49 *Specifications*: The portion of the Contract Documents consisting of the written requirements of the Work for materials, equipment, systems, standards, workmanship, and performance of related services.
- 1.50 *Subcontractor*: An individual or entity undertaking the execution of any part of the Work by virtue of a written agreement with the Contractor or any other Subcontractor. Also, an individual or entity retained by the Contractor or any other Subcontractor as an independent contractor to provide the labor, materials, equipment or services necessary to complete a specific portion of the Work.
- 1.51 *Substantial Completion Date*: Point of time when the Work or a designated portion of the Work is sufficiently complete in compliance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended purpose without unscheduled disruption. Substantial Completion is documented by the date of the Certificate of Substantial Completion signed by the Owner and the Contractor.
- 1.52 *Superintendent*: The representative of the Contractor on the job site, authorized by the Contractor to receive and fulfill instructions from the Consultant.
- 1.53 *Surety*: The individual or entity that is legally bound with the Contractor and Subcontractor to insure the faithful performance of the contract and for the payment of the bills for labor, materials and equipment by the Contractor and Subcontractors.

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Definitions**

- 1.54 *Work*: The construction and services, whether completed or partially completed, including all labor, materials, equipment and services provided or to be provided by the Contractor and Subcontractors to fulfill the requirements of the Project as described in the Contract Documents.

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**1. Preconstruction Conference**

- 1.1 The Contractor shall, upon acceptance of a contract and prior to commencing work, schedule a preconstruction conference with the Owner and Consultant. The purpose of this conference is as follows.
  - 1.1.1 Introduce all parties who have a significant role in the Project, including:
    - Owner (State agency or other contracting entity)
    - Owner's Representative
    - Consultant (Architect or Engineer)
    - Subconsultants
    - Clerk-of-the-works
    - Contractor (GC)
    - Superintendent
    - Subcontractors
    - Other State agencies
    - Construction testing company
    - Commissioning agent
    - Special Inspections agent
    - Bureau of General Services (BGS);
  - 1.1.2 Review the responsibilities of each party;
  - 1.1.3 Review any previously-identified special provisions of the Project;
  - 1.1.4 Review the Schedule of the Work calendar submitted by the Contractor to be approved by the Owner and Consultant;
  - 1.1.5 Review the Schedule of Values form submitted by the Contractor to be approved by the Owner and Consultant;
  - 1.1.6 Establish routines for Shop Drawing approval, contract changes, requisitions, et cetera;
  - 1.1.7 discuss jobsite issues;
  - 1.1.8 Discuss Project close-out procedures;
  - 1.1.9 Provide an opportunity for clarification of Contract Documents before work begins; and
  - 1.1.10 Schedule regular meetings at appropriate intervals for the review of the progress of the Work.

**2. Intent and Correlation of Contract Documents**

- 2.1 The intent of the Contract Documents is to describe the complete Project. The Contract Documents consist of various components; each component complements the others. What is shown as a requirement by any one component shall be inferred as a requirement on all corresponding components.
- 2.2 The Contractor shall furnish all labor, equipment and materials, tools, transportation, insurance, services, supplies, operations and methods necessary for, and reasonably incidental to, the construction and completion of the Project. Any work that deviates from the Contract Documents which appears to be required by the exigencies of construction or by inconsistencies in the Contract Documents, will be determined by the Consultant and authorized in writing by the Consultant, Owner and the Bureau prior to execution. The Contractor shall be responsible for requesting clarifying information where the intent of the Contract Documents is uncertain.
- 2.3 The Contractor shall not utilize any apparent error or omission in the Contract Documents to the disadvantage of the Owner. The Contractor shall promptly notify the Consultant in writing of such errors or omissions. The Consultant shall make any corrections or clarifications necessary in such a situation to document the true intent of the Contract Documents.

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**3. Additional Drawings and Specifications**

- 3.1 Upon the written request of the Contractor, the Owner shall provide, at no expense to the Contractor, up to five sets of printed Drawings and Specifications for the execution of the Work.
- 3.2 The Consultant shall promptly furnish to the Contractor revised Drawings and Specifications, for the area of the documents where those revisions apply, when corrections or clarifications are made by the Consultant. All such information shall be consistent with, and reasonably inferred from, the Contract Documents. The Contractor shall do no work without the proper Drawings and Specifications.

**4. Ownership of Contract Documents**

- 4.1 The designs represented on the Contract Documents are the property of the Consultant. The Drawings and Specifications shall not be used on other work without consent of the Consultant.

**5. Permits, Laws, and Regulations**

- 5.1 The Owner is responsible for obtaining any zoning approvals or other similar local project approvals necessary to complete the Work, unless otherwise specified in the Contract Documents.
- 5.2 The Owner is responsible for obtaining Maine Department of Environmental Protection, Maine Department of Transportation, or other similar state government project approvals necessary to complete the Work, unless otherwise indicated in the Contract Documents.
- 5.3 The Owner is responsible for obtaining any federal agency project approvals necessary to complete the Work, unless otherwise indicated in the Contract Documents.
- 5.4 The Owner is responsible for obtaining all easements for permanent structures or permanent changes in existing facilities.
- 5.5 The Contractor is responsible for obtaining and paying for all permits and licenses necessary for the implementation of the Work. The Contractor shall notify the Owner of any delays, variance or restrictions that may result from the issuing of permits and licenses.
- 5.6 The Contractor shall comply with all ordinances, laws, rules and regulations and make all required notices bearing on the implementation of the Work. In the event the Contractor observes disagreement between the Drawings and Specifications and any ordinances, laws, rules and regulations, the Contractor shall promptly notify the Consultant in writing. Any necessary changes shall be made as provided in the contract for changes in the work. The Contractor shall not perform any work knowing it to be contrary to such ordinances, laws, rules and regulations.
- 5.7 The Contractor shall comply with local, state and federal regulations regarding construction safety and all other aspects of the Work.
- 5.8 The Contractor shall comply with the Maine Code of Fair Practices and Affirmative Action, 5 M.R.S. §784 (2).

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**6. Taxes**

- 6.1 The Owner is exempt from the payment of Maine State sales and use taxes as provided in 36 M.R.S. §1760 (1). The Contractor and Subcontractors shall not include taxes on exempt items in the construction contract.
- 6.2 Section 1760 further provides in subsection 61 that sales to a construction contractor or its subcontractor of tangible personal property that is to be physically incorporated in, and become a permanent part of, real property for sale to or owned by the Owner, are exempt from Maine State sales and use taxes. Tangible personal property is defined in 36 M.R.S. §1752 (17).
- 6.3 The Contractor may contact Maine Revenue Services, 24 State House Station, Augusta, Maine 04333 for guidance on tax exempt regulations authorized by 36 M.R.S. §1760 and detailed in Rule 302 (18-125 CMR 302).

**7. Labor and Wages**

- 7.1 The Contractor shall conform to the labor laws of the State of Maine, and all other laws, ordinances, and legal requirements affecting the work in Maine.
- 7.2 The Consultant shall include a wage determination document prepared by the Maine Department of Labor in the Contract Documents for state-funded contracts in excess of \$50,000. The document shows the minimum wages required to be paid to each category of labor employed on the project.
- 7.3 On projects requiring a Maine wage determination, the Contractor shall submit monthly payroll records to the Owner ("the contracting agency") showing the name and occupation of all workers and all independent contractors employed on the project. The monthly submission must also include the Contractor's company name, the title of the project, hours worked, hourly rate or other method of remuneration, and the actual wages or other compensation paid to each person.
- 7.4 The Contractor shall not reveal, in the payroll records submitted to the Owner, personal information regarding workers and independent contractors, other than the information described above. Such information shall not include Social Security number, employee identification number, or employee address or phone number, for example.
- 7.5 The Contractor shall conform to Maine statute (39-A M.R.S. §105-A (6)) by providing to the Workers' Compensation Board a list of all subcontractors and independent contractors on the job site and a record of the entity to whom that subcontractor or independent contractor is directly contracted and by whom that subcontractor or independent contractor is insured for workers' compensation purposes.
- 7.6 The Contractor shall enforce strict discipline and good order among their employees at all times, and shall not employ any person unfit or unskilled to do the work assigned to them.
- 7.7 The Contractor shall promptly pay all employees when their compensation is due, shall promptly pay all others who have billed and are due for materials, supplies and services used in the Work, and shall promptly pay all others who have billed and are due for insurance, workers compensation coverage, federal and state unemployment compensation, and Social Security



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charges pertaining to this Project. Before final payments are made, the Contractor shall furnish to the Owner affidavits that all such payments described above have been made.

- 7.8 The Contractor may contact the Maine Department of Labor, 54 State House Station, Augusta, Maine 04333 for guidance on labor issues.
- 7.9 The Contractor may contact the Maine Workers' Compensation Board, 27 State House Station, Augusta, Maine 04333 for guidance on workers' compensation issues.

**8. Indemnification**

- 8.1 The Contractor shall indemnify and hold harmless the Owner and its officers and employees from and against any and all damages, liabilities, and costs, including reasonable attorney's fees, and defense costs, for any and all injuries to persons or property, including claims for violation of intellectual property rights, to the extent caused by the negligent acts or omissions of the Contractor, its employees, agents, officers or subcontractors in the performance of work under this Agreement. The Contractor shall not be liable for claims to the extent caused by the negligent acts or omissions of the Owner or for actions taken in reasonable reliance on written instructions of the Owner.
- 8.2 The Contractor shall notify the Owner promptly of all claims arising out of the performance of work under this Agreement by the Contractor, its employees or agents, officers or subcontractors.
- 8.3 This indemnity provision shall survive the termination of the Agreement, completion of the project or the expiration of the term of the Agreement.

**9. Insurance Requirements**

- 9.1 The Contractor shall provide, with each original of the signed Contract, an insurance certificate or certificates acceptable to the Owner and BGS. The Contractor shall submit insurance certificates to the Owner and BGS at the commencement of this Contract and at policy renewal or revision dates. The certificates shall identify the project name and BGS project number, and shall name the Owner as certificate holder and as additional insured for general liability and automobile liability coverages. The submitted forms shall contain a provision that coverage afforded under the insurance policies will not be canceled or materially changed unless at least ten days prior written notice by registered letter has been given to the Owner and BGS.
- 9.2 The Owner does not warrant or represent that the insurance required herein constitutes an insurance portfolio which adequately addresses all risks faced by the Contractor or its Subcontractors. The Contractor is responsible for the existence, extent and adequacy of insurance prior to commencement of work. The Contractor shall not allow any Subcontractor to commence work until all similar insurance required of the Subcontractor has been confirmed by the Contractor.
- 9.3 The Contractor shall procure and maintain primary insurance for the duration of the Project and, if written on a Claims-Made basis, shall also procure and maintain Extended Reporting Period (ERP) insurance for the period of time that any claims could be brought. The Contractor shall ensure that all Subcontractors they engage or employ will procure and maintain similar insurance

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in form and amount acceptable to the Owner and BGS. At a minimum, the insurance shall be of the types and limits set forth herein protecting the Contractor from claims which may result from the Contractor's execution of the Work, whether such execution be by the Contractor or by those employed by the Contractor or by those for whose acts they may be liable. All required insurance coverages shall be placed with carriers authorized to conduct business in the State of Maine by the Maine Bureau of Insurance.

- 9.3.1 The Contractor shall have Workers' Compensation insurance for all employees on the Project site in accordance with the requirements of the Workers' Compensation law of the State of Maine.

Minimum acceptable limits for Employer's Liability are:

|                                |                         |
|--------------------------------|-------------------------|
| Bodily Injury by Accident..... | \$500,000               |
| Bodily Injury by Disease.....  | \$500,000 Each Employee |
| Bodily Injury by Disease.....  | \$500,000 Policy Limit  |

- 9.3.2 The Contractor shall have Commercial General Liability insurance providing coverage for bodily injury and property damage liability for all hazards of the Project including premise and operations, products and completed operations, contractual, and personal injury liabilities. The policy shall include collapse and underground coverage as well as explosion coverage if explosion hazards exist. Aggregate limits shall apply on a location or project basis. Minimum acceptable limits are:

|   |             |
|---|-------------|
| General aggregate limit.....                      | \$2,000,000 |
| Products and completed operations aggregate ..... | \$1,000,000 |
| Each occurrence limit.....                        | \$1,000,000 |
| Personal injury aggregate .....                   | \$1,000,000 |

- 9.3.3 The Contractor shall have Automobile Liability insurance against claims for bodily injury, death or property damage resulting from the maintenance, ownership or use of all owned, non-owned and hired automobiles, trucks and trailers. Minimum acceptable limit is:

|                                |           |
|--------------------------------|-----------|
| Any one accident or loss ..... | \$500,000 |
|--------------------------------|-----------|

- 9.3.4 For the portion of a project which is new construction, the Contractor shall procure and maintain Builder's Risk insurance naming the Owner, Contractor, and any Subcontractor as insureds as their interest may appear. Covered causes of loss form shall be all Risks of Direct Physical Loss, endorsed to include flood, earthquake, transit and sprinkler leakage where sprinkler coverage is applicable. Unless specifically authorized in writing by the Owner, the limit of insurance shall not be less than the initial contract amount, for the portion of the project which is new construction, and coverage shall apply during the entire contract period and until the work is accepted by the Owner.

- 9.3.5 The Contractor shall have Owner's Protective Liability insurance for contract values \$50,000 and above, naming the Owner as the Named Insured. Minimum acceptable limits are:

|                              |             |
|------------------------------|-------------|
| General aggregate limit..... | \$2,000,000 |
| Each occurrence limit.....   | \$1,000,000 |

## 10. Contract Bonds

- 10.1 When noted as required in the Bid Documents, the Contractor shall provide to the Owner a Performance Bond and a Payment Bond, or "contract bonds", upon execution of the contract. Each bond value shall be for the full amount of the contract and issued by a surety company authorized to do business in the State of Maine as approved by the Owner. The bonds shall be

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executed on the forms furnished in the Bid Documents. The bonds shall allow for any subsequent additions or deductions of the contract.

- 10.2 The contract bonds shall continue in effect for one year after final acceptance of the contract to protect the Owner's interest in connection with the one year guarantee of workmanship and materials and to assure settlement of claims for the payment of all bills for labor, materials and equipment by the Contractor.

**11. Patents and Royalties**

- 11.1 The Contractor shall, for all time, secure for the Owner the free and undisputed right to the use of any patented articles or methods used in the Work. The expense of defending any suits for infringement or alleged infringement of such patents shall be borne by the Contractor. Awards made regarding patent suits shall be paid by the Contractor. The Contractor shall hold the Owner harmless regarding patent suits that may arise due to installations made by the Contractor, and to any awards made as a result of such suits.
- 11.2 Any royalty payments related to the work done by the Contractor for the Project shall be borne by the Contractor. The Contractor shall hold the Owner harmless regarding any royalty payments that may arise due to installations made by the Contractor.

**12. Surveys, Layout of Work**

- 12.1 The Owner shall furnish all property surveys unless otherwise specified.
- 12.2 The Contractor is responsible for correctly staking out the Work on the site. The Contractor shall employ a competent surveyor to position all construction on the site. The surveyor shall run the axis lines, establish correct datum points and check each line and point on the site to insure their accuracy. All such lines and points shall be carefully preserved throughout the construction.
- 12.3 The Contractor shall lay out all work from dimensions given on the Drawings. The Contractor shall take measurements and verify dimensions of any existing work that affects the Work or to which the Work is to be fitted. The Contractor is solely responsible for the accuracy of all measurements. The Contractor shall verify all grades, lines, levels, elevations and dimensions shown on the Drawings and report any errors or inconsistencies to the Consultant prior to commencing work.

**13. Record of Documents**

- 13.1 The Contractor shall maintain one complete set of Contract Documents on the jobsite, in good order and current status, for access by the Owner and Consultant.
- 13.2 The Contractor shall maintain, continuously updated, complete records of Requests for Information, Architectural Supplemental Instructions (or equivalent), Information Bulletins, supplemental sketches, Change Order Proposals, Change Orders, Shop Drawings, testing reports, et cetera, for access by the Owner and Consultant.

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**14. Allowances**

- 14.1 The Contract Price shall include all allowances described in the Contract Documents. The Contractor shall include all overhead and profit necessary to implement each allowance in their Contract Price.
- 14.2 The Contractor shall not be required to employ parties for allowance work against whom the Contractor has a reasonable objection. In such a case, the Contractor shall notify the Owner in writing of their position and shall propose an alternative party to complete the work of the allowance.

**15. Shop Drawings**

- 15.1 The Contractor shall administer Shop Drawings prepared by the Contractor, Subcontractors, suppliers or others to conform to the approved Schedule of the Work. The Contractor shall verify all field measurements, check and authorize all Shop Drawings and schedules required by the Work. The Contractor is the responsible party and contact for the Contractor's work as well as that of Subcontractors, suppliers or others who provide Shop Drawings.
- 15.2 The Consultant shall review and acknowledge Shop Drawings, with reasonable promptness, for general conformity with the design concept of the project and compliance with the information provided in the Contract Documents.
- 15.3 The Contractor shall provide monthly updated logs containing: requests for information, information bulletins, supplemental instructions, supplemental sketches, change order proposals, change orders, submittals, testing and deficiencies.
- 15.4 The Contractor shall make any corrections required by the Consultant, and shall submit a quantity of corrected copies as may be needed. The acceptance of Shop Drawings or schedules by the Consultant shall not relieve the Contractor from responsibility for deviations from Drawings and Specifications, unless the Contractor has called such deviations to the attention of the Consultant at the time of submission and secured the Consultant's written approval. The acceptance of Shop Drawings or schedules by the Consultant does not relieve the Contractor from responsibility for errors in Shop Drawings or schedules.

**16. Samples**

- 16.1 The Contractor shall furnish for approval, with reasonable promptness, all samples as directed by the Consultant. The Consultant shall review and approve such samples, with reasonable promptness, for general conformity with the design concept of the project and compliance with the information provided in the Contract Documents. The subsequent work shall be in accord with the approved samples.

**17. Substitutions**

- 17.1 The Contractor shall furnish items and materials described in the Contract Documents. If the item or material specified describes a proprietary product, or uses the name of a manufacturer, the term "or approved equal" shall be implied, if it is not included in the text. The specific item or material specified establishes a minimum standard for the general design, level of quality, type, function, durability, efficiency, reliability, compatibility, warranty coverage, installation factors

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and required maintenance. The Drawing or written Specification shall not be construed to exclude other manufacturers products of comparable design, quality, and efficiency.

- 17.2 The Contractor may submit detailed information about a proposed substitution to the Consultant for consideration. Particular models of items and particular materials which the Contractor asserts to be equal to the items and materials identified in the Contract Documents shall be allowed only with written approval by the Consultant. The request for substitution shall include a cost comparison and a reason or reasons for the substitution.
- 17.3 The Consultant may request additional information about the proposed substitution. The approval or rejection of a proposed substitution may be based on timeliness of the request, source of the information, the considerations of minimum standards described above, or other considerations. The Consultant should briefly state the rationale for the decision. The decision shall be considered final.
- 17.4 The duration of a substitution review process can not be the basis for a claim for delay in the Schedule of the Work.

**18. Assignment of Contract**

- 18.1 The Contractor shall not assign or sublet the contract as a whole without the written consent of the Owner. The Contractor shall not assign any money due to the Contractor without the written consent of the Owner.

**19. Separate Contracts**

- 19.1 The Owner reserves the right to create other contracts in connection with this Project using similar General Conditions. The Contractor shall allow the Owner's other contractors reasonable opportunity for the delivery and storage of materials and the execution of their work. The Contractor shall coordinate and properly connect the Work of all contractors.
- 19.2 The Contractor shall promptly report to the Consultant and Owner any apparent deficiencies in work of the Owner's other contractors that impacts the proper execution or results of the Contractor. The Contractor's failure to observe or report any deficiencies constitutes an acceptance of the Owner's other contractors work as suitable for the interface of the Contractor's work, except for latent deficiencies in the Owner's other contractors work.
- 19.3 Similarly, the Contractor shall promptly report to the Consultant and Owner any apparent deficiencies in their own work that would impact the proper execution or results of the Owner's other contractors.
- 19.4 The Contractor shall report to the Consultant and Owner any conflicts or claims for damages with the Owner's other contractors and settle such conflicts or claims for damages by mutual agreement or arbitration, if necessary, at no expense to the Owner.
- 19.5 In the event the Owner's other contractors sue the Owner regarding any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at the Contractor's expense. The Contractor shall pay or satisfy any judgment that may arise against the Owner, and pay all other costs incurred.

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**20. Subcontracts**

- 20.1 The Contractor shall not subcontract any part of this contract without the written permission of the Owner.
- 20.2 The Contractor shall submit a complete list of named Subcontractors and material suppliers to the Consultant and Owner for approval by the Owner prior to commencing work. The Subcontractors named shall be reputable companies of recognized standing with a record of satisfactory work.
- 20.3 The Contractor shall not employ any Subcontractor or use any material until they have been approved, or where there is reason to believe the resulting work will not comply with the Contract Documents.
- 20.4 The Contractor, not the Owner, is as fully responsible for the acts and omissions of Subcontractors and of persons employed by them, as the Contractor is for the acts and omissions of persons directly or indirectly employed by the Contractor.
- 20.5 Neither the Contract Documents nor any Contractor-Subcontractor contract shall indicate, infer or create any direct contractual relationship between any Subcontractor and the Owner.

**21. Contractor-Subcontractor Relationship**

- 21.1 The Contractor shall be bound to the Subcontractor by all the obligations in the Contract Documents that bind the Contractor to the Owner.
- 21.2 The Contractor shall pay the Subcontractor, in proportion to the dollar value of the work completed and requisitioned by the Subcontractor, the approved dollar amount allowed to the Contractor no more than seven days after receipt of payment from the Owner.
- 21.3 The Contractor shall pay the Subcontractor accordingly if the Contract Documents or the subcontract provide for earlier or larger payments than described in the provision above.
- 21.4 The Contractor shall pay the Subcontractor for completed and requisitioned subcontract work, less retainage, no more than seven days after receipt of payment from the Owner for the Contractor's approved Requisition for Payment, even if the Consultant fails to certify a portion of the Requisition for Payment for a cause not the fault of the Subcontractor.
- 21.5 The Contractor shall not make a claim for liquidated damages or penalty for delay in any amount in excess of amounts that are specified by the subcontract.
- 21.6 The Contractor shall not make a claim for services rendered or materials furnished by the Subcontractor unless written notice is given by the Contractor to the Subcontractor within ten calendar days of the day in which the claim originated.
- 21.7 The Contractor shall give the Subcontractor an opportunity to present and to submit evidence in any progress conference or disputes involving subcontract work.

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- 21.8 The Contractor shall pay the Subcontractor a just share of any fire insurance payment received by the Contractor.
- 21.9 The Subcontractor shall be bound to the Contractor by the terms of the Contract Documents and assumes toward the Contractor all the obligations and responsibilities that the Contractor, by those documents, assumes toward the Owner.
- 21.10 The Subcontractor shall submit applications for payment to the Contractor in such reasonable time as to enable the Contractor to apply for payment as specified.
- 21.11 The Subcontractor shall make any claims for extra cost, extensions of time or damages, to the Contractor in the manner provided in these General Conditions for like claims by the Contractor to the Owner, except that the time for the Subcontractor to make claims for extra cost is seven calendar days after the receipt of Consultant's instructions.

**22. Supervision of the Work**

- 22.1 During all stages of the Work the Contractor shall have a competent superintendent, with any necessary assistant superintendents, overseeing the project. The superintendent shall not be reassigned without the consent of the Owner unless a superintendent ceases to be employed by the Contractor due to unsatisfactory performance.
- 22.2 The superintendent represents the Contractor on the jobsite. Directives given by the Consultant or Owner to the superintendent shall be as binding as if given directly to the Contractor's main office. All important directives shall be confirmed in writing to the Contractor. The Consultant and Owner are not responsible for the acts or omissions of the superintendent or assistant superintendents.
- 22.3 The Contractor shall provide supervision of the Work equal to the industry's highest standard of care. The superintendent shall carefully study and compare all Contract Documents and promptly report any error, inconsistency or omission discovered to the Consultant. The Contractor may not necessarily be held liable for damages resulting directly from any error, inconsistency or omission in the Contract Documents or other instructions by the Consultant that was not revealed by the superintendent in a timely way.

**23. Observation of the Work**

- 23.1 The Contractor shall allow the Owner, the Consultant and the Bureau continuous access to the site for the purpose of observation of the progress of the work. All necessary safeguards and accommodations for such observations shall be provided by the Contractor.
- 23.2 The Contractor shall coordinate all required testing, approval or demonstration of the Work. The Contractor shall give sufficient notice to the appropriate parties of readiness for testing, inspection or examination.
- 23.3 The Contractor shall schedule inspections and obtain all required certificates of inspection for inspections by a party other than the Consultant.



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- 23.4 The Consultant shall make all scheduled observations promptly, prior to the work being concealed or buried by the Contractor. If approval of the Work is required of the Consultant, the Contractor shall notify the Consultant of the construction schedule in this regard. Work concealed or buried prior to the Consultant's approval may need to be uncovered at the Contractor's expense.
- 23.5 The Consultant may order reexamination of questioned work, and, if so ordered, the work must be uncovered by the Contractor. If the work is found to conform to the Contract Documents, the Owner shall pay the expense of the reexamination and remedial work. If the work is found to not conform to the Contract Documents, the Contractor shall pay the expense, unless the defect in the work was caused by the Owner's Contractor, whose responsibility the reexamination expense becomes.
- 23.6 The Bureau shall periodically observe the Work during the course of construction and make recommendations to the Contractor or Consultant as necessary. Such recommendations shall be considered and implemented through the usual means for changes to the Work.
24. Consultant's Status
- 24.1 The Consultant represents the Owner during the construction period, and observes the work in progress on behalf of the Owner. The Consultant has authority to act on behalf of the Owner only to the extent expressly provided by the Contract Documents or otherwise demonstrated to the Contractor. The Consultant has authority to stop the work whenever such an action is necessary, in the Consultant's reasonable opinion, to ensure the proper execution of the contract.
- 24.2 The Consultant is the interpreter of the conditions of the contract and the judge of its performance. The Consultant shall favor neither the Owner nor the Contractor, but shall use the Consultant's powers under the contract to enforce faithful performance by both parties.
- 24.3 In the event of the termination of the Consultant's employment on the project prior to completion of the work, the Owner shall appoint a capable and reputable replacement. The status of the new Consultant relative to this contract shall be that of the former Consultant.
25. Management of the Premises
- 25.1 The Contractor shall place equipment and materials, and conduct activities on the premises in a manner that does not unreasonably hinder site circulation, environmental stability, or any long term effect. Likewise, the Consultant's directions shall not cause the use of premises to be impeded for the Contractor or Owner.
- 25.2 The Contractor shall not use the premises for any purpose other than that which is directly related to the scope of work. The Owner shall not use the premises for any purpose incompatible with the proposed work simultaneous to the work of the Contractor.
- 25.3 The Contractor shall enforce the Consultant's instructions regarding information posted on the premises such as signage and advertisements, as well as activities conducted on the premises such as fires, and smoking.



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- 25.4 The Owner may occupy any part of the Project that is completed with the written consent of the Contractor, and without prejudice to any of the rights of the Owner or Contractor. Such use or occupancy shall not, in and of itself, be construed as a final acceptance of any work or materials.
26. Safety and Security of the Premises
- 26.1 The Contractor shall designate, and make known to the Consultant and the Owner, a safety officer whose duty is the prevention of accidents on the site.
- 26.2 The Contractor shall continuously maintain security on the premises and protect from unreasonable occasion of injury all people authorized to be on the job site. The Contractor shall also effectively protect the property and adjacent properties from damage or loss.
- 26.3 The Contractor shall take all necessary precautions to ensure the safety of workers and others on and adjacent to the site, abiding by applicable local, state and federal safety regulations. The Contractor shall erect and continuously maintain safeguards for the protection of workers and others, and shall post signs and other warnings regarding hazards associated with the construction process, such as protruding fasteners, moving equipment, trenches and holes, scaffolding, window, door or stair openings, and falling materials.
- 26.4 The Contractor shall restore the premises to conditions that existed prior to the start of the project at areas not intended to be altered according to the Contract Documents.
- 26.5 The Contractor shall protect existing utilities and exercise care working in the vicinity of utilities shown in the Drawings and Specifications or otherwise located by the Contractor.
- 26.6 The Contractor shall protect from damage existing trees and other significant plantings and landscape features of the site which will remain a permanent part of the site. If necessary or indicated in the Contract Documents, tree trunks shall be boxed and barriers erected to prevent damage to tree branches or roots.
- 26.7 The Contractor shall repair or replace damage to the Work caused by the Contractor's or Subcontractor's forces, including that which is reasonably protected, at the expense of the responsible party.
- 26.8 The Contractor shall not load, or allow to be loaded, any part of the Project with a force which imperils personal or structural safety. The Consultant may consult with the Contractor on such means and methods of construction, however, the ultimate responsibility lies with the Contractor.
- 26.9 The Contractor shall not jeopardize any work in place with subsequent construction activities such as blasting, drilling, excavating, cutting, patching or altering work. The Consultant must approve altering any structural components of the project. The Contractor shall supervise all construction activities carried out by others on site to ensure that the work is neatly done and in a manner that will not endanger the structure or the component parts.
- 26.10 The Contractor may act with their sole discretion in emergency situations that potentially effect health, life or serious damage to the premises or adjacent properties, to prevent such potential loss or injury. The Contractor may negotiate with the Owner for compensation for expenses due to such emergency work.

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**General Conditions**

- 26.11 The Contractor and Subcontractors shall have no responsibility for the identification, discovery, presence, handling, removal or disposal of, or exposure of persons to, hazardous materials in any form at the project site. The Contractor shall avoid disruption of any hazardous materials or toxic substances at the project site and promptly notify the Owner in writing on the occasion of such a discovery.
- 26.12 The Contractor shall keep the premises free of any unsafe accumulation of waste materials caused by the work. The Contractor shall regularly keep the spaces “broom clean”. See the Close-out of the Work provisions of this section regarding cleaning at the completion of the project.

**27. Changes in the Work**

- 27.1 The Contractor shall not proceed with extra work without an approved Change Order or Construction Change Directive. A Change Order which has been properly signed by all parties shall become a part of the contract.
- 27.2 A Change Order is the usual document for directing changes in the Work. In certain circumstances, however, the Owner may utilize a Construction Change Directive to direct the Contractor to perform changes in the Work that are generally consistent with the scope of the project. The Owner shall use a Construction Change Directive only when the normal process for approving changes to the Work has failed to the detriment of the Project, or when agreement on the terms of a Change Order cannot be met, or when an urgent situation requires, in the Owner's judgment, prompt action by the Contractor.
- 27.3 The Consultant shall prepare the Construction Change Directive representing a complete scope of work, with proposed Contract Price and Contract Time revisions, if any, clearly stated.
- 27.4 The Contractor shall promptly carry out a Construction Change Directive which has been signed by the Owner and the Consultant. Work thus completed by the Contractor constitutes the basis for a Change Order. Changes in the Contract Price and Contract Time shall be as defined in the Construction Change Directive unless subsequently negotiated with some other terms.
- 27.5 The method of determining the dollar value of extra work shall be by:
- .1 an estimate of the Contractor accepted by Owner as a lump sum, or
  - .2 unit prices named in the contract or subsequently agreed upon, or
  - .3 cost plus a designated percentage, or
  - .4 cost plus a fixed fee.
- 27.6 The Contractor shall determine the dollar value of the extra work for both the lump sum and cost plus designated percentage methods so as not to exceed the following rates. The rates include all overhead and profit expenses.
- .1 Contractor - for any work performed by the Contractor's own forces, up to 20% of the cost;
  - .2 Subcontractor - for work performed by Subcontractor's own forces, up to 20% of the cost;
  - .3 Contractor - for work performed by Contractor's Subcontractor, up to 10% of the amount due the Subcontractor.
- 27.7 The Contractor shall keep and provide records as needed or directed for the cost plus designated percentage method. The Consultant shall review and certify the appropriate amount which

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includes the Contractor's overhead and profit. The Owner shall make payments based on the Consultant's certificate.

- 27.8 Cost reflected in Change Orders shall be limited to the following: cost of materials, cost of delivery, cost of labor (including Social Security, pension, Workers' Compensation insurance, and unemployment insurance), and cost of rental of power tools and equipment. Labor cost may include a pro-ratio share of a foreman's time only in the case of an extension of contract time granted due to the Change Order.
- 27.9 Overhead reflected in Change Orders shall be limited to the following: bond premium, supervision, wages of clerks, time keepers, and watchmen, small tools, incidental expenses, general office expenses, and all other overhead expenses directly related to the Change Order.
- 27.10 The Contractor shall provide credit to the Owner for labor, materials, equipment and other costs but not overhead and profit expenses for those Change Order items that result in a net value of credit to the contract.
- 27.11 The Owner may change the scope of work of the Project without invalidating the contract. The Owner shall notify the Contractor of a change of the scope of work for the Owner's Contractors, which may affect the work of this Contractor, without invalidating the contract. Change Orders for extension of the time caused by such changes shall be developed at the time of directing the change in scope of work.
- 27.12 The Consultant may order minor changes in the Work, not involving extra cost, which is consistent with the intent of the design or project.
- 27.13 The Contractor shall immediately give written notification to the Consultant of latent conditions discovered at the site which materially differ from those represented in the Drawings or Specifications, and which may eventually result in a change in the scope of work. The Contractor shall suspend work until receiving direction from the Consultant. The Consultant shall promptly investigate the conditions and respond to the Contractor's notice with direction that avoids any unnecessary delay of the Work. The Consultant shall determine if the discovered conditions warrant a Change Order.
- 27.14 The Contractor shall, within ten calendar days of receipt of the information, give written notification to the Consultant if the Contractor claims that instructions by the Consultant will constitute extra cost not accounted for by Change Order or otherwise under the contract. The Consultant shall promptly respond to the Contractor's notice with direction that avoids any unnecessary delay of the Work. The Consultant shall determine if the Contractor's claim warrants a Change Order.

**28. Correction of the Work**

- 28.1 The Contractor shall promptly remove from the premises all work the Consultant declares is non-conforming to the contract. The Contractor shall replace the work properly at no expense to the Owner. The Contractor is also responsible for the expenses of others whose work was damaged or destroyed by such remedial work.

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**General Conditions**

- 28.2 The Owner may elect to remove non-conforming work if it is not removed by the Contractor within a reasonable time, that time defined in a written notice from the Consultant. The Owner may elect to store removed non-conforming work not removed by the Contractor at the Contractor's expense. The Owner may, with ten days written notice, dispose of materials which the Contractor does not remove. The Owner may sell the materials and apply the net proceeds, after deducting all expenses, to the costs that should have been borne by the Contractor.
- 28.3 The Contractor shall remedy any defects due to faulty materials or workmanship and pay for any related damage to other work which appears within a period of one year from the date of substantial completion, and in accord with the terms of any guarantees provided in the contract. The Owner shall promptly give notice of observed defects to the Contractor and Consultant. The Consultant shall determine the status of all claimed defects. The Contractor shall perform all remedial work without unjustifiable delay in either the initial response or the corrective action.
- 28.4 The Consultant may authorize, after a reasonable notification to the Contractor, an equitable deduction from the contract amount in lieu of the Contractor correcting non-conforming or defective work.
29. Owner's Right to do Work
- 29.1 The Owner may, using other contractors, correct deficiencies attributable to the Contractor, or complete unfinished work. Such action shall take place only after giving the Contractor three days written notice, and provided the Consultant approves of the proposed course of action as an appropriate remedy. The Owner may then deduct the cost of the remedial work from the amount due the Contractor.
- 29.2 The Owner may act with their sole discretion when the Contractor is unable to take action in emergency situations that potentially effect health, life or serious damage to the premises or adjacent properties, to prevent such potential loss or injury. The Owner shall inform the Contractor of the emergency work performed, particularly where it may affect the work of the Contractor.
30. Termination of Contract and Stop Work Action
- 30.1 The Owner may, owing to a certificate of the Consultant indicating that sufficient cause exists to justify such action, without prejudice to any other right or remedy and after giving the Contractor and the Contractor's surety seven days written notice, terminate the employment of the Contractor. At that time the Owner may take possession of the premises and of all materials,

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**General Conditions**

tools and appliances on the premises and finish the work by whatever method the Owner may deem expedient. Cause for such action by the Owner includes:

- .1 the contractor is adjudged bankrupt, or makes a general assignment for the benefit of its creditors, or
- .2 a receiver is appointed due to the Contractor's insolvency, or
- .3 the Contractor persistently or repeatedly refuses or fails to provide enough properly skilled workers or proper materials, or
- .4 the Contractor fails to make prompt payment to Subcontractors or suppliers of materials or labor, or
- .5 the Contractor persistently disregards laws, ordinances or the instructions of the Consultant, or is otherwise found guilty of a substantial violation of a provision of the Contract Documents.

- 30.2 The Contractor is not entitled, as a consequence of the termination of the employment of the Contractor as described above, to receive any further payment until the Work is finished. If the unpaid balance of the contract amount exceeds the expense of finishing the Work, including compensation for additional architectural, managerial and administrative services, such balance shall be paid to the Contractor. If the expense of finishing the Work exceeds the unpaid balance, the Contractor shall pay the difference to the Owner. The Consultant shall certify the expense incurred by the Contractor's default. This obligation for payment shall continue to exist after termination of the contract.
- 30.3 The Contractor may, if the Work is stopped by order of any court or other public authority for a period of thirty consecutive days, and through no act or fault of the Contractor or of anyone employed by the Contractor, with seven days written notice to the Owner and the Consultant, terminate this contract. The Contractor may then recover from the Owner payment for all work executed, any proven loss and reasonable profit and damage.
- 30.4 The Contractor may, if the Consultant fails to issue a certificate for payment within seven days after the Contractor's formal request for payment, through no fault of the Contractor, or if the Owner fails to pay to the Contractor within 30 days after submission of any sum certified by the Consultant, with seven days written notice to the Owner and the Consultant, stop the Work or terminate this Contract.

### 31. Delays and Extension of Time

- 31.1 The completion date of the contract shall be extended if the work is delayed by changes ordered in the work which have approved time extensions, or by an act or neglect of the Owner, the Consultant, or the Owner's Contractor, or by strikes, lockouts, fire, flooding, unusual delay in transportation, unavoidable casualties, or by other causes beyond the Contractor's control. The Consultant shall determine the status of all claimed causes.
- 31.2 The contract shall not be extended for delay occurring more than seven calendar days before the Contractor's claim made in writing to the Consultant. In case of a continuing cause of delay, only one claim is necessary.
- 31.3 The contract shall not be extended due to failure of the Consultant to furnish drawings if no schedule or agreement is made between the Contractor and the Consultant indicating the dates

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**General Conditions**

which drawings shall be furnished and fourteen calendar days has passed after said date for such drawings.

- 31.4 This article does not exclude the recovery of damages for delay by either party under other provisions in the Contract Document.

**32. Payments to the Contractor**

- 32.1 As noted under *Preconstruction Conference* in this section, the Contractor shall submit a Schedule of Values form, before the first application for payment, for approval by the Owner and Consultant. The Consultant may direct the Contractor to provide evidence that supports the correctness of the form. The approved Schedule of Values shall be used as a basis for payments.
- 32.2 The Contractor shall submit an application for each payment ("Requisition for Payment") on a form approved by the Owner and Consultant. The Consultant may require receipts or other documents showing the Contractor's payments for materials and labor, including payments to Subcontractors.
- 32.3 The Contractor shall submit Requisitions for Payment as the work progresses not more frequently than once each month, unless the Owner approves a more frequent interval due to unusual circumstances. The Requisition for Payment is based on the proportionate quantities of the various classes of work completed or incorporated in the Work, in agreement with the actual progress of the Work and the dollar value indicated in the Schedule of Values.
- 32.4 The Consultant shall verify and certify each Requisition for Payment which appears to be complete and correct prior to payment being made by the Owner. The Consultant may certify an appropriate amount for materials not incorporated in the Work which have been delivered and suitably stored at the site. The Contractor shall submit bills of sale, insurance certificates, or other such documents that will adequately protect the Owner's interests prior to payments being certified.
- 32.5 In the event any materials delivered but not yet incorporated in the Work have been included in a certified Requisition for Payment with payment made, and said materials thereafter are damaged, deteriorated or destroyed, or for any reason whatsoever become unsuitable or unavailable for use in the Work, the full amount previously allowed shall be deducted from subsequent payments unless the Contractor satisfactorily replaces said material.
- 32.6 The Contractor may request certification of an appropriate dollar amount for materials not incorporated in the Work which have been delivered and suitably stored away from the site. The Contractor shall submit bills of sale, insurance certificates, right-of-entry documents or other such documents that will adequately protect the Owner's interests. The Consultant shall determine if the Contractor's documentation for the materials is complete and specifically designated for the Project. The Owner may allow certification of such payments.
- 32.7 Subcontractors may request, and shall receive from the Consultant, copies of approved Requisitions for Payment showing the amounts certified in the Schedule of Values.
- 32.8 Certified Requisitions for Payment, payments made to the Contractor, or partial or entire occupancy of the project by the Owner shall not constitute an acceptance of any work that does

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not conform to the Contract Documents. The making and acceptance of the final payment constitutes a waiver of all claims by the Owner, other than those arising from unsettled liens, from faulty work or materials appearing within one year from final payment or from requirements of the Drawings and Specifications, and of all claims by the Contractor, except those previously made and still unsettled.

### 33. Payments Withheld

- 33.1 The Owner shall retain five percent of each payment due the Contractor as part security for the fulfillment of the contract by the Contractor. The Owner may make payment of a portion of this “retainage” to the Contractor temporarily or permanently during the progress of the Work. The Owner may thereafter withhold further payments until the full amount of the five percent is reestablished. The Contractor may deposit with the Maine State Treasurer certain securities in place of retainage amounts due according to Maine Statute (5 M.R.S. §1746).
- 33.2 The Consultant may withhold or nullify the whole or a portion of any Requisitions for Payment submitted by the Contractor in the amount that may be necessary, in his reasonable opinion, to protect the Owner from loss due to any of the following:
- .1 defective work not remedied;
  - .2 claims filed or reasonable evidence indicating probable filing of claims;
  - .3 failure to make payments properly to Subcontractors or suppliers;
  - .4 a reasonable doubt that the contract can be completed for the balance then unpaid;
  - .5 liability for damage to another contractor.

The Owner shall make payment to the Contractor, in the amount withheld, when the above circumstances are removed.

### 34. Liens

- 34.1 The Contractor shall deliver to the Owner a complete release of all liens arising out of this contract before the final payment or any part of the retainage payment is released. The Contractor shall provide with the release of liens an affidavit asserting each release includes all labor and materials for which a lien could be filed. Alternately, the Contractor, in the event any Subcontractor or supplier refuses to furnish a release of lien in full, may furnish a bond satisfactory to the Owner, to indemnify the Owner against any lien.
- 34.2 In the event any lien remains unsatisfied after all payments to the Contractor are made by the Owner, the Contractor shall refund to the Owner all money that the latter may be compelled to pay in discharging such lien, including all cost and reasonable attorney’s fees.

### 35. Workmanship

- 35.1 The Contractor shall provide materials, equipment, and installed work equal to or better than the quality specified in the Contract Documents and approved in submittal and sample. The installation methods shall be of the highest standards, and the best obtainable from the respective trades. The Consultant’s decision on the quality of work shall be final.



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**General Conditions**

- 35.2 The Contractor shall know local labor conditions for skilled and unskilled labor in order to apply the labor appropriately to the Work. All labor shall be performed by individuals well skilled in their respective trades.
- 35.3 The Contractor shall perform all cutting, fitting, patching and placing of work in such a manner to allow subsequent work to fit properly, whether that be by the Contractor, the Owner's Contractors or others. The Owner and Consultant may advise the Contractor regarding such subsequent work. Notwithstanding the notification or knowledge of such subsequent work, the Contractor may be directed to comply with this standard of compatible construction by the Consultant at the Contractor's expense.
- 35.4 The Contractor shall request clarification or revision of any design work by the Consultant, prior to commencing that work, in a circumstance where the Contractor believes the work cannot feasibly be completed at the highest quality, or as indicated in the Contract Documents. The Consultant shall respond to such requests in a timely way, providing clarifying information, a feasible revision, or instruction allowing a reduced quality of work. The Contractor shall follow the direction of the Consultant regarding the required request for information.
- 35.5 The Contractor shall guarantee the Work against any defects in workmanship and materials for a period of one year commencing with the date of the Certificate of Substantial Completion, unless specified otherwise for specific elements of the project. The Work may also be subdivided in mutually agreed upon components, each defined by a separate Certificate of Substantial Completion.
36. Close-out of the Work
- 36.1 The Contractor shall remove from the premises all waste materials caused by the work. The Contractor shall make the spaces "broom clean" unless a more thorough cleaning is specified. The Contractor shall clean all windows and glass immediately prior to the final inspection, unless otherwise directed.
- 36.2 The Owner may conduct the cleaning of the premises where the Contractor, duly notified by the Consultant, fails to adequately complete the task. The expense of this cleaning may be deducted from the sum due to the Contractor.
- 36.3 The Contractor shall participate in all final inspections and acknowledge the documentation of unsatisfactory work, customarily called the "punch list", to be corrected by the Contractor. The Consultant shall document the successful completion of the Work in a dated Certificate of Substantial Completion, to be signed by Owner, Consultant, and Contractor.
- 36.4 The Contractor shall not call for final inspection of any portion of the Work that is not completely and permanently installed. The Contractor may be found liable for the expenses of individuals called to final inspection meetings prematurely.
- 36.5 The Contractor and all major Subcontractors shall participate in the end-of-warranty-period conference, typically scheduled close to one year after the Substantial Completion date.



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**General Conditions**

**37. Date of Completion and Liquidated Damages**

- 37.1 The Contractor may make a written request to the Owner for an extension or reduction of time, if necessary. The request shall include the reasons the Contractor believes justifies the proposed completion date. The Owner may grant the revision of the contract completion date if the Work was delayed due to conditions beyond the control and the responsibility of the Contractor. The Contractor shall not conduct unauthorized accelerated work or file delay claims to recover alleged damages for unauthorized early completion.
- 37.2 The Contractor shall vigorously pursue the completion of the Work and notify the Owner of any factors that have, may, or will affect the approved Schedule of the Work. The Contractor may be found responsible for expenses of the Owner or Consultant if the Contractor fails to make notification of project delays.
- 37.3 The Project is planned to be done in an orderly fashion which allows for an iterative submittal review process, construction administration including minor changes in the Work and some bad weather. The Contractor shall not file delay claims to recover alleged damages on work the Consultant determines has followed the expected rate of progress.
- 37.4 The Consultant shall prepare the Certificate of Substantial Completion which, when signed by the Owner and the Contractor, documents the date of Substantial Completion of the Work or a designated portion of the Work. The Owner shall not consider the issuance of a Certificate of Occupancy by an outside authority a prerequisite for Substantial Completion if the Certificate of Occupancy cannot be obtained due to factors beyond the Contractor's control.
- 37.5 Liquidated Damages may be deducted from the sum due to the Contractor for each calendar day that the Work remains uncompleted after the completion date specified in the Contract or an approved amended completion date. The dollar amount per day shall be calculated using the Schedule of Liquidated Damages table shown below.

| If the original contract amount is:   | The per day Liquidated Damages shall be:                     |
|---------------------------------------|--|
| Less than \$100,000                   | \$250  |
| \$100,000 to less than \$2,000,000    | \$750  |
| \$2,000,000 to less than \$10,000,000 | \$1,500  |
| \$10,000,000 and greater              | \$1,500 plus \$250 for<br>each \$2,000,000 over \$10,000,000 |

**38. Dispute Resolution**

**38.1 Mediation**

- 38.1.1 A dispute between the parties which arises under this Contract which cannot be resolved through informal negotiation, shall be submitted to a neutral mediator jointly selected by the parties.
- 38.1.2 Either party may file suit before or during mediation if the party, in good faith, deems it to be necessary to avoid losing the right to sue due to a statute of limitations. If suit is filed before good faith mediation efforts are completed, the party filing suit shall agree to stay all proceedings in the lawsuit pending completion of the mediation process, provided such stay is without prejudice.

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**General Conditions**

38.1.3 In any mediation between the Owner and the Consultant, the Owner has the right to consolidate related claims between Owner and Contractor.

38.2 Arbitration

38.2.1 If the dispute is not resolved through mediation, the dispute shall be settled by arbitration. The arbitration shall be conducted before a panel of three arbitrators. Each party shall select one arbitrator; the third arbitrator shall be appointed by the arbitrators selected by the parties. The arbitration shall be conducted in accordance with the Maine Uniform Arbitration Act (MUAA), except as otherwise provided in this section.

38.2.2 The decision of the arbitrators shall be final and binding upon all parties. The decision may be entered in court as provided in the MUAA.

38.2.3 The costs of the arbitration, including the arbitrators' fees shall be borne equally by the parties to the arbitration, unless the arbitrator orders otherwise.

38.2.4 In any arbitration between the Owner and the Consultant, the Owner has the right to consolidate related claims between Owner and Contractor.

01 May 2020

**00 73 46**  
**Wage Determination Schedule**

**PART 1- GENERAL**

**1.1 Related Documents**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specifications Sections, apply to this Section.

**1.2 Summary**

- A. This Section includes the wage determination requirements for Contractors as issued by the State of Maine Department of Labor Bureau of Labor Standards or the United States Department of Labor.

**1.3 Requirements**

- A. Conform to the wage determination schedule for this project which is shown on the following page. The most recent wage schedule published by the Bureau of Labor Standards is to be used.

**PART 2 - PRODUCTS (not used)**

**PART 3 - EXECUTION (not used)**

State of Maine Department of Labor - Bureau of Labor Standards  
Augusta, Maine 04333-0045 - Telephone (207) 623-7906

Wage Determination - In accordance with 26 MRS §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid to laborers and workers employed on the below titled project.

2024 Fair Minimum Wage Rates -- Building 2 Kennebec County (other than 1 or 2 family homes)

| Occupational Title   | Minimum Wage | Minimum Benefit | Total    |
|--|--------------|-----------------|----------|
| Brickmasons And Blockmasons  | \$42.55      | \$28.02         | \$70.57  |
| Bulldozer Operator   | \$31.50      | \$7.53          | \$39.03  |
| Carpenter  | \$29.68      | \$12.51         | \$42.19  |
| Cement Masons And Concrete Finisher  | \$24.13      | \$4.15          | \$28.28  |
| Commercial Divers  | \$30.00      | \$4.62          | \$34.62  |
| Construction And Maintenance Painters  | \$24.00      | \$0.00          | \$24.00  |
| Construction Laborer   | \$22.67      | \$2.80          | \$25.47  |
| Crane And Tower Operators  | \$38.50      | \$10.43         | \$48.93  |
| Crushing Grinding And Polishing Machine Operators                              | \$23.00      | \$4.94          | \$27.94  |
| Drywall And Ceiling Tile Installers  | \$26.20      | \$10.62         | \$36.82  |
| Earth Drillers - Except Oil And Gas  | \$21.61      | \$5.53          | \$27.14  |
| Electrical Power - Line Installer And Repairers                                | \$38.93      | \$8.91          | \$47.84  |
| Electricians   | \$38.51      | \$6.00          | \$44.51  |
| Elevator Installers And Repairers  | \$68.38      | \$45.29         | \$113.67 |
| Excavating And Loading Machine And Dragline Operators                          | \$54.28      | \$34.31         | \$88.59  |
| Excavator Operator   | \$28.00      | \$1.67          | \$29.67  |
| Fence Erectors   | \$26.75      | \$4.05          | \$30.80  |
| Flaggers   | \$20.00      | \$0.38          | \$20.38  |
| Floor Layers - Except Carpet/Wood/Hard Tiles                                   | \$27.25      | \$6.59          | \$33.84  |
| Glaziers   | \$37.00      | \$6.60          | \$43.60  |
| Grader/Scraper Operator  | \$23.00      | \$1.99          | \$24.99  |
| Hazardous Materials Removal Workers  | \$21.00      | \$1.99          | \$22.99  |
| Heating And Air Conditioning And Refrigeration Mechanics And Installers        | \$32.00      | \$5.60          | \$37.60  |
| Heavy And Tractor - Trailer Truck Drivers                                      | \$22.75      | \$1.04          | \$23.79  |
| Highway Maintenance Workers  | \$20.00      | \$0.00          | \$20.00  |
| Industrial Machinery Mechanics   | \$31.25      | \$1.01          | \$32.26  |
| Industrial Truck And Tractor Operators   | \$29.25      | \$4.06          | \$33.31  |
| Insulation Worker - Mechanical   | \$23.00      | \$3.59          | \$26.59  |
| Ironworker - Ornamental  | \$30.83      | \$24.97         | \$55.80  |
| Light Truck Or Delivery Services Drivers                                       | \$23.34      | \$1.67          | \$25.01  |
| Millwrights  | \$33.75      | \$8.78          | \$42.53  |
| Mobile Heavy Equipment Mechanics - Except Engines                              | \$27.75      | \$4.89          | \$32.64  |
| Operating Engineers And Other Equipment Operators                              | \$24.00      | \$2.38          | \$26.38  |
| Paver Operator   | \$27.03      | \$6.49          | \$33.52  |
| Pile-Driver Operators  | \$32.75      | \$1.95          | \$34.70  |
| Pipelayers   | \$28.50      | \$4.89          | \$33.39  |
| Plumbers Pipe Fitters And Steamfitters   | \$29.50      | \$5.48          | \$34.98  |
| Pump Operators - Except Wellhead Pumpers                                       | \$31.49      | \$32.08         | \$63.57  |
| Radio Cellular And Tower Equipment Installers                                  | \$26.00      | \$3.77          | \$29.77  |
| Reclaimer Operator   | \$27.03      | \$7.68          | \$34.71  |
| Reinforcing Iron And Rebar Workers   | \$30.83      | \$24.97         | \$55.80  |
| Riggers  | \$29.25      | \$7.79          | \$37.04  |
| Roofers  | \$23.75      | \$3.11          | \$26.86  |
| Screed/Wheelman  | \$29.25      | \$4.94          | \$34.19  |
| Sheet Metal Workers  | \$25.00      | \$5.35          | \$30.35  |
| Structural Iron And Steel Workers  | \$30.08      | \$7.61          | \$37.69  |
| Tapers   | \$32.63      | \$0.00          | \$32.63  |
| Telecommunications Equipment Installers And Repairers - Except Line Installers | \$28.00      | \$6.35          | \$34.35  |
| Telecommunications Line Installers And Repairers                               | \$31.03      | \$18.73         | \$49.76  |
| Tile And Marble Setters  | \$27.75      | \$6.73          | \$34.48  |

Welders are classified as the trade to which welding is incidental (e.g. welding structural steel is Structural Iron and Steel Worker)

Apprentices – The minimum wage rates for registered apprentices are the rates recognized in the sponsorship agreement for registered apprentices working in the pertinent classification.

For any other specific trade on this project not listed above, contact the Bureau of Labor Standards for further clarification.

Title 26 §1310 requires that a clearly legible statement of all fair minimum wage and benefits rates to be paid the several classes of laborers, workers and mechanics employed on the construction on the public work must be kept posted in a prominent and easily accessible place at the site by each contractor and subcontractor subject to sections 1304 to 1313.

Appeal – Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates.

A true copy

Attest: Scott R. Cotnoir  
Scott R. Cotnoir  
Wage & Hour Director  
Bureau of Labor Standards

Expiration Date: 12-31-2024  
Revision Date: 2-1-2024

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased Construction.
4. Contractor's use of site and premises.
5. Owner-furnished/Contractor-installed (OFCD) products
6. Owner-furnished/Owner-installed (OFOI) products.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and Drawing conventions.
10. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 DEFINITIONS

- A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

- A. Project Identification: Security Screening Centers, State House and Cross Office Building.

1. Project Location: 111 Sewall Street, Augusta, Maine 04330.

- B. Owner: Bureau of General Services, State of Maine, 111 Sewall Street, Augusta, Maine 04330.

1. Owner's Representative: John Kenney, 207-624-7341.

- C. Architect: Oak Point Associates, 207-283-0193.

1. Architect's Representative: Leah Schaffer, AIA, 207-283-0193.

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

1. Geotechnical Engineering: R.W. Gillespie & Associates, Inc.
  - a. Geotechnical Engineer Representative: Erik Wiberg, 207-286-8008.

#### 1.5 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
- B. The project consists of demolition of existing capital police offices and adjacent spaces, and construction of new offices at the existing cafeteria annex. A new steel-framed entry vestibule with granite veneer and new internal screening area. All associated site work, mechanical, plumbing, sprinkler, and electrical is included in the project scope, and other Work indicated in the Contract Documents. Renovations on the State House side to include selective demolition of the café space and work associated with room becoming the new screening area. Additional work for removal and replacement of communication antennas as indicated in the Contract Documents.
- C. Type of Contract:
  1. Project will be constructed under a single prime contract.

#### 1.6 PHASED CONSTRUCTION

- A. Construct the work in phases as indicated on Drawings. Phases 2 and 3 can be completed concurrently.
- B. Work in the State House is to occur after adjournment in June. Schedule is to be coordinated with Owner.
- C. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence commencement and completion dates and move-out and -in dates of Owner's personnel for all phases of the Work.

#### 1.7 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
  1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
  2. Provide for delivery of Owner-furnished products to Project site.
  3. Upon delivery, inspect, with Contractor present, delivered items.
    - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

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4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

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

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.
7. For Installation of Specialty Security Equipment:
  - a. Coordination: Coordinate installation with surrounding building construction and elements interfacing with security equipment.
  - b. Preinstallation Meeting: Convene one week before starting work of this Section.
  - c. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

C. Owner-Furnished/Contractor-Installed (OFCI) Products:

1. Security Screening Equipment including X-Ray Baggage Scanners, turnstiles, and Walk-through Weapons Detection systems.
2. Items as indicated on AE202 for communication antennae. Items include WMA300 by Site Pro 1, Schedule 40 Galvanized Pipe, communication cables, Universal Snap-In Hangers by Site Pro 1, WM1665 Through Wall Clamps by Site Pro 1, BA 4" Rubber Boot Kit by Site Pro 1, HDWM08 Mounting Clamps by Site Pro 1, and PVC pipe for GPS Antenna mounting.
3. Undercounter Fridge at Lactation Room 109 and Property Management 112.
4. Other items as indicated on Drawings.

1.8 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS

A. The Owner will furnish and install products indicated.

B. Owner-Furnished/Owner-Installed (OFOI) Products:

1. Partial height screening surround at State House Security Screening 139.
2. Antennae and pipe to pipe clamps at Penthouse.
3. Other items as indicated on Drawings.

1.9 CONTRACTOR'S USE OF SITE AND PREMISES

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

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- B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Driveways, Walkways and Entrances: Keep driveways, parking, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

#### 1.10 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Project site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
  - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
  - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

#### 1.11 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to between 7:30 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
  - 1. Weekend and Off Hours: Prior approval from Owner required.



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- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
  - 1. Notify Owner not less than seven days in advance of proposed utility interruptions.
  - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
  - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
  - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times. Access badges will be required and provided by Owner.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
  - 1. Maintain list of approved screened personnel with Owner's representative.

#### 1.12 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
  - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
  - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

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- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

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SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
  - 1. Contingency allowances.
- C. Related Requirements:
  - 1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
  - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

- A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

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- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

#### 1.6 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials under allowance shall be included as part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

#### 1.7 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment under the contingency allowance are included in the allowance. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

#### 1.8 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.
  - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
  - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
  - 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
  - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Granite stone panels. Contingency Allowance: Include a contingency allowance of \$65,000 to provide new granite stone panels at existing South Elevation, as specified in Section 044200 "Exterior Stone Cladding." Note that this allowance is in addition to areas of granite panels noted on elevations as remove, store, and reinstall.
  - 1. Coordinate allowance adjustment with unit price requirements in Section 012200 "Unit Prices."
- B. Allowance No. 2: Existing Windows Flashing and Sealant Repair. Contingency Allowance: Include a contingency allowance of \$8,000 to repair tears, rotted blocking, and failing sealant at the South Elevation windows where roofing is tying into the window sills.

END OF SECTION

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SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for procedures for using unit prices to adjust quantity allowances.
  - 2. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
  - 3. Section 014000 "Quality Requirements" for field testing by an independent testing agency.

1.2 DEFINITIONS

- A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the Part 3 "Schedule of Unit Prices" Article contain requirements for materials described under each unit price.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Granite stone panels.

1. Description: Provide granite stone panels at South Elevation in accordance with Section 044200 "Exterior Stone Cladding." Stone panel removals and installation are included as Work of the Contract and are not included in this unit price.
2. Unit of Measurement: Square foot of 4-inch-thick granite panel.
3. Contingency Allowance: Coordinate unit price with allowance adjustment requirements in Section 012100 "Allowances."

B. Unit Price No. 2: Steel Piles.

1. Description: Include labor, materials, tools, equipment, and incidentals for furnishing, driving, cutting off, capping, and disposing cutoffs for steel HP pile in addition to length indicated on Structural Drawings. Note Unit Price is to be used for additional pile length or credit for less than indicated on Structural Drawings.
2. Unit Measurement: 1 linear foot.

END OF SECTION

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SECTION 012300 - ALTERNATES

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 administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.



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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Entry Display Case.

1. Base Bid: Do not provide display case at Entry Vest 125 as indicated on Drawing 2/AE403.
2. Alternate: Provide display case at Entry Vest 125 as indicated on Drawings 6/AE403, 17/AE403, and 18/AE403 and as specified in Section 101200 "Display Cases."

END OF SECTION

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SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for products selected under an allowance.
  - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use form acceptable to Architect.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size,

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- durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
  - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. Certificates and qualification data, where applicable or requested.
  - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 QUALITY ASSURANCE

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

#### 1.5 PROCEDURES

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

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1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - b. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
  - c. Requested substitution provides sustainable design characteristics that specified product provided for compliance with IgCC requirements.
  - d. Requested substitution provides sustainable design characteristics that specified product provided for compliance with ASHRAE 189.1 requirements.
  - e. Requested substitution provides sustainable design characteristics that specified product provided for compliance with Green Globes requirements.
  - f. Substitution request is fully documented and properly submitted.
  - g. Requested substitution will not adversely affect Contractor's construction schedule.
  - h. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - i. Requested substitution is compatible with other portions of the Work.
  - j. Requested substitution has been coordinated with other portions of the Work.
  - k. Requested substitution provides specified warranty.
  - l. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience:
1. Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on Architect's standard form.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within 10 business days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

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finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- e. Quotation Form: Use forms acceptable to Architect.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

## 1.5 CHANGE ORDER PROCEDURES

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

## 1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Owner's name.
    - c. Owner's Project number.
    - d. Name of Architect.



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- e. Architect's Project number.
  - f. Contractor's name and address.
  - g. Date of submittal.
- 2. Arrange schedule of values consistent with format of AIA Document G703.
- 3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
  - a. Related Specification Section or division.
  - b. Description of the Work.
  - c. Name of subcontractor.
  - d. Name of manufacturer or fabricator.
  - e. Name of supplier.
  - f. Change Orders (numbers) that affect value.
  - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
    - 1) Labor.
    - 2) Materials.
    - 3) Equipment.
- 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
- 5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site.
- 6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
- 8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
- 9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
- 10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
- 11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
- 12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

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1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Architect at each monthly requisition meeting. The period covered by each Application for Payment is one month, ending on the last day of the month.
  - 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- D. Application for Payment Forms: Use Owner provided form as form for Applications for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
  - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  - 3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

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- G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
  - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit conditional final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  - 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of values.
  - 3. Contractor's construction schedule (preliminary if not final).
  - 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
  - 5. Products list (preliminary if not final).
  - 6. Sustainable design action plans, including preliminary project materials cost data.
  - 7. Schedule of unit prices.
  - 8. Submittal schedule (preliminary if not final).
  - 9. List of Contractor's staff assignments.
  - 10. List of Contractor's principal consultants.
  - 11. Copies of building permits.
  - 12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  - 13. Initial progress report.
  - 14. Report of preconstruction conference.
  - 15. Certificates of insurance and insurance policies.
  - 16. Performance and payment bonds.
  - 17. Data needed to acquire Owner's insurance.
- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

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- a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
  2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Certification of completion of final punch list items.
  3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  4. Updated final statement, accounting for final changes to the Contract Sum.
  5. AIA Document G706.
  6. AIA Document G706A.
  7. AIA Document G707.
  8. Evidence that claims have been settled.
  9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  10. Final liquidated damages settlement statement.
  11. Proof that taxes, fees, and similar obligations are paid.
  12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. RFIs.
  - 3. Digital project management procedures.
  - 4. Project meetings.
- B. Related Requirements:
  - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.

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- C. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
  - 1. Post copies of list in Project meeting room, in temporary field office, and in prominent location in built facility. Keep list current at all times.

#### 1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Project closeout activities.
  - 8. Startup and adjustment of systems.

#### 1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

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1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
  2. Owner name.
  3. Owner's Project number.
  4. Name of Architect.
  5. Architect's Project number.
  6. Date.
  7. Name of Contractor.
  8. RFI number, numbered sequentially.
  9. RFI subject.
  10. Specification Section number and title and related paragraphs, as appropriate.
  11. Drawing number and detail references, as appropriate.
  12. Field dimensions and conditions, as appropriate.
  13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  14. Contractor's signature.
  15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow three days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.

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2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect.
  4. RFI number, including RFIs that were returned without action or withdrawn.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

## 1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
  2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
  3. Digital Drawing Software Program: Contract Drawings are available in AutoCad 2017.
  4. Contractor shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
    - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
  5. The following digital data files will be furnished for each appropriate discipline:
    - a. Floor plans.
    - b. Reflected ceiling plans.



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- B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
  3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

## 1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Responsibilities and personnel assignments.
    - b. Tentative construction schedule.
    - c. Phasing.
    - d. Critical work sequencing and long lead items.
    - e. Designation of key personnel and their duties.
    - f. Lines of communications.
    - g. Use of web-based Project software.
    - h. Procedures for processing field decisions and Change Orders.
    - i. Procedures for RFIs.
    - j. Procedures for testing and inspecting.
    - k. Procedures for processing Applications for Payment.
    - l. Distribution of the Contract Documents.
    - m. Submittal procedures.
    - n. Preparation of Record Documents.
    - o. Use of the premises and existing building.
    - p. Work restrictions.

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- q. Working hours.
  - r. Owner's occupancy requirements.
  - s. Responsibility for temporary facilities and controls.
  - t. Procedures for moisture and mold control.
  - u. Procedures for disruptions and shutdowns.
  - v. Construction waste management and recycling.
  - w. Parking availability.
  - x. Office, work, and storage areas.
  - y. Equipment deliveries and priorities.
  - z. First aid.
  - aa. Security.
  - bb. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written instructions.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.

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- x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  - 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of Record Documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Procedures for completing and archiving web-based Project software site data files.
    - d. Submittal of written warranties.
    - e. Requirements for preparing operations and maintenance data.
    - f. Requirements for delivery of material samples, attic stock, and spare parts.
    - g. Requirements for demonstration and training.
    - h. Preparation of Contractor's punch list.
    - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - j. Submittal procedures.
    - k. Responsibility for removing temporary facilities and controls.
  - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.
- 1. Coordinate dates of meetings with preparation of payment requests.
  - 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

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3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site use.
      - 8) Temporary facilities and controls.
      - 9) Progress cleaning.
      - 10) Quality and work standards.
      - 11) Status of correction of deficient items.
      - 12) Field observations.
      - 13) Status of RFIs.
      - 14) Status of Proposal Requests.
      - 15) Pending changes.
      - 16) Status of Change Orders.
      - 17) Pending claims and disputes.
      - 18) Documentation of information for payment requests.
  4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
    - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

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2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
  - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
  - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
  - c. Review present and future needs of each contractor present, including the following:
    - 1) Interface requirements.
    - 2) Sequence of operations.
    - 3) Status of submittals.
    - 4) Deliveries.
    - 5) Off-site fabrication.
    - 6) Access.
    - 7) Site use.
    - 8) Temporary facilities and controls.
    - 9) Work hours.
    - 10) Hazards and risks.
    - 11) Progress cleaning.
    - 12) Quality and work standards.
    - 13) Status of RFIs.
    - 14) Proposal Requests.
    - 15) Change Orders.
    - 16) Pending changes.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Startup construction schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Construction schedule updating reports.
  - 4. Site condition reports.
  - 5. Unusual event reports.
- B. Related Requirements:
  - 1. Section 014000 "Quality Requirements" for schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
  - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C. Event: The starting or ending point of an activity.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

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- B. Format for Submittals: Submit required submittals in the following format:
  - 1. Working electronic copy of schedule file.
  - 2. PDF file.
- C. Startup construction schedule.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
  - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.
- G. Unusual Event Reports: Submit at time of unusual event.
- H. Qualification Data: For scheduling consultant.

#### 1.5 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from entities involved.
  - 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

#### 1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
  - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
  - 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:

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- a. Securing of approvals and permits required for performance of the Work.
    - b. Temporary facilities.
    - c. Construction of mock-ups, prototypes and samples.
    - d. Owner interfaces and furnishing of items.
    - e. Interfaces with Separate Contracts.
    - f. Regulatory agency approvals.
    - g. Punch list.
  3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
  5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
  6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
  7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
  2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  3. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Partial occupancy before Substantial Completion.
    - e. Use-of-premises restrictions.
    - f. Seasonal variations.
    - g. Environmental control.
  4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Submittals.
    - c. Purchases.
    - d. Mockups.
    - e. Fabrication.
    - f. Sample testing.
    - g. Deliveries.
    - h. Installation.



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- i. Tests and inspections.
  - j. Adjusting.
  - k. Curing.
- 5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
  - a. Structural completion.
  - b. Temporary enclosure and space conditioning.
  - c. Permanent space enclosure.
  - d. Completion of electrical installation.
  - e. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
  - 1. Unresolved issues.
  - 2. Unanswered Requests for Information.
  - 3. Rejected or unreturned submittals.
  - 4. Notations on returned submittals.
  - 5. Pending modifications affecting the Work and the Contract Time.
- G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate Final Completion percentage for each activity.
- H. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

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1.7 REPORTS

- A. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- B. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
  - 1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
  - 3. Final completion construction photographs.
- B. Related Requirements:
  - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
  - 2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- C. Digital Photographs: Submit image files within three days of taking photographs.
  - 1. Submit photos by uploading to web-based project software site. Include copy of key plan indicating each photograph's location and direction.
  - 2. Identification: Provide the following information with each image description in web-based project software site:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date photograph was taken.
    - f. Description of location, vantage point, and direction.
    - g. Unique sequential identifier keyed to accompanying key plan.

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#### 1.4 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- C. Metadata: Record accurate date and time and GPS location data from camera.
- D. File Names: Name media files with date, Project area, and sequential numbering suffix.

#### 1.5 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before commencement of excavation, commencement of demolition, and starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
  - 1. Flag construction limits before taking construction photographs.
  - 2. Take 20 photographs to show existing conditions for each primary work area before starting the Work.
  - 3. Take 20 photographs of existing buildings to accurately record physical conditions at start of construction.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take 20 photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Final Completion Construction Photographs: Take 100 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
2. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
3. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
4. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

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1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
3. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal Category: Action; informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's final release or approval.

#### 1.4 SUBMITTAL FORMATS

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

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

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

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1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
  2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
  4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
  5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
  6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using AIA Document G810 transmittal form.
- E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number and specification section.
- F. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

## 1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
    - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
  2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
  3. Paper: Prepare submittals in paper form and deliver to Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

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4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
  - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with reviewed notation from Architect's action stamp.

## 1.6 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.



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- d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams that show factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
    - a. Three opaque copies of each submittal. Architect will retain one copy; remainder will be returned.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
  2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.

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- f. Specification paragraph number and generic name of each item.
3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
  - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
  - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
  - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
  1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be

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- signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
  3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
  4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
  5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
  6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - a. Name of evaluation organization.
  - b. Date of evaluation.
  - c. Time period when report is in effect.
  - d. Product and manufacturers' names.
  - e. Description of product.
  - f. Test procedures and results.
  - g. Limitations of use.

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## 1.7 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## 1.8 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
  - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

## 1.9 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
  - 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action
  - 2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action
  - 3. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

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- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                              |  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|--|------------------------------|--|-----------------------------|--------------|----------------|------|------------|-------------|----------------|-------------------------------------|----------------------|----------------------|-------------|------------|------------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                              |  |                             |              |                |      |            |             |                | BGS PROJECT NO: 3676<br>CONTRACTOR: |                      |                      |             |            |                  |           |       |      |  |
| DATE<br>REC'D.   | SPECIFICATION<br>SECTION NO. | SUBMITTAL ITEM                                 | CONTRACTOR<br>SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |             |                | ACTION                              |                      |                      |             |            | DATE<br>RETURNED | COPIES TO |       |      |  |
|  |                              |  |                             |              | DATE<br>SENT   | FIRM | NO. COPIES | DUE<br>DATE | DATE<br>REC'D. | APPROVED                            | APPROVED<br>AS NOTED | REVISE &<br>RESUBMIT | NOT APP' D. | CONTRACTOR |                  | OWNER     | FIELD | FILE |  |
|  | 012100                       | <b>ALLOWANCES</b>                              |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Purchase Proposals                             |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Invoices/Delivery Slips                        |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Time Sheets                                    |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Allowance Items                                |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 012500                       | <b>SUBSTITUTION PROCEDURES</b>                 |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Substitution Requests                          |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data                                   |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Samples  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Qualification Statements                       |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Material Test Reports                          |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Warranty                                       |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 013100                       | <b>PROJECT MANAGEMENT AND<br/>COORDINATION</b> |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Subcontract List                               |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Key Personnel Names                            |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 013200                       | <b>CONSTRUCTION PROGRESS<br/>DOCUMENTATION</b> |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Startup Construction Schedule                  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Contractor's Construction Schedule             |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Applications for Payment                       |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Site Condition Reports                         |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Unusual Event Reports                          |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Qualification Data                             |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 013300                       | <b>SUBMITTAL PROCEDURES</b>                    |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data                                   |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Shop Drawings                                  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Samples  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Schedule                               |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Qualification Data                             |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Design Data                                    |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Certificates                                   |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Test and Research Reports                      |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 014000                       | <b>QUALITY REQUIREMENTS</b>                    |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Contractor's Quality-Control Plan              |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Qualification Data                             |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|---|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |   |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                                    | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |   |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Contractor's Statement of Responsibility          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Testing Agency Qualifications                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Schedule of Tests and Inspections                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Reports   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Permits, Licenses, and Certificates               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 014535                    | <b>SPECIAL INSPECTIONS</b>                        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Preconstruction Submittals                        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Test Reports                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Certificates                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 015000                    | <b>TEMPORARY FACILITIES AND CONTROLS</b>          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Site Utilization Plan                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Implementation and Termination Schedule           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Project Identification and Temporary Signs        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Fire-Safety Program                               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Moisture- and Mold-Protection Plan                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Dust- and HVAC-Control Plan                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Noise and Vibration Control Plan                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 015639                    | <b>TEMPORARY TREE AND PLANT PROTECTION</b>        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Existing Conditions                               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 017300                    | <b>EXECUTION</b>                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Utilities and Mechanical and Electrical Systems   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 017419                    | <b>CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL</b> |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Landfill And Incinerator Disposal Records         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 017700                    | <b>CLOSEOUT PROCEDURES</b>                        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Contractor's List of Incomplete Items             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Certified List of Incomplete Items                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Certificates of Release                           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Certificates of Insurance                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Report                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Schedule of Maintenance Material Items            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 017823                    | <b>OPERATION AND MAINTENANCE DATA</b>             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|---|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |   |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM  | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |   |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Operation and Maintenance Manuals Indicated           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 017839                    | <b>PROJECT RECORD DOCUMENTS</b>                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Record Drawings                                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Record Specifications                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Record Product Data                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Miscellaneous Record Submittals                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 024119                    | <b>SELECTIVE DEMOLITION</b>                           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Statements                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Engineering Survey                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Survey of Existing Conditions                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Proposed Protection Measures                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Schedule of Selective Demolition                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Statement of Refrigerant Recovery                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Warranties  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Inventory   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 032000                    | <b>CONCRETE REINFORCING</b>                           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Construction Joint Layout                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Statements                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Material Test Reports                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Minutes of Preinstallation Conference                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 033000                    | <b>CAST-IN-PLACE CONCRETE</b>                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Design Mixtures                                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Concrete Schedule                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Material Certificates                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Material Test Reports                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Floor Surface Flatness & Levelness Measurement Report |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Research Reports                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Preconstruction Test Reports                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |



SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|---|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |   |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                                | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |   |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Field Quality-Control Reports                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Minutes of Preinstallation Conference         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 044200                    | <b>EXTERIOR STONE CLADDING</b>                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Stone Samples for Verification                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Colored Point Mortar Samples for Verification |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Deleted Design Submittal                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Material Test Reports                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Cold-Weather Procedures                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 051200                    | <b>STRUCTURAL STEEL FRAMING</b>               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Welding Procedure Specifications (WPSs)       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Delegated Design Submittal                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Welding Certificates                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Paint Compatibility Certificates              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Mill Test Reports                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Test Reports                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Survey of Existing Conditions                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Source Quality-Control Reports                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 052100                    | <b>STEEL JOIST FRAMING</b>                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Welding Certificates                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Manufacturer Certificates                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Paint Compatibility Certificates              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Mill Certificates                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Comprehensive Engineering Analysis            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|----------------------------------|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |                                  |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                   | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |                                  |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  | <b>053100</b>             | <b>STEEL DECKING</b>             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Welding Certificates             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Certificates             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Test and Evaluation Reports      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Statements         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>054000</b>             | <b>COLD-FORMED METAL FRAMING</b> |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Delegated Design Submittal       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Certificates             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Test Reports             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Research Reports                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>055213</b>             | <b>PIPE AND TUBE RAILINGS</b>    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Delegated Design Submittal       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Welding Certificates             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Test Reports             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>055000</b>             | <b>METAL FABRICATIONS</b>        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sustainable Design               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Mill Certificates                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Welding Certificates             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Paint Compatibility Certificates |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Research Reports                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>055813</b>             | <b>COLUMN COVERS</b>             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>061000</b>             | <b>ROUGH CARPENTRY</b>           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG   |                           |  |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|---|---------------------------|--|--------------------------|--------------|----------------|------|------------|----------|-------------|----------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME |                           |  |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676 |                   |                   |             |            |               |           |       |      |  |
| OWNER: BUREAU OF GENERAL SERVICES                                       |                           |  |                          |              |                |      |            |          |             | CONTRACTOR:          |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.   | SPECIFICATION SECTION NO. | SUBMITTAL ITEM   | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION               |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|   |                           |  |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED             | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|   |                           | Product Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   | 061600                    | <b>SHEATHING</b>   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   | 064116                    | <b>PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS</b>        |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Shop Drawings  |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Samples  |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Evaluation Reports   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Field Quality Control Reports                              |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Quality Standard Compliance Certificates                   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   | 071113                    | <b>BITUMINOUS DAMPPROOFING</b>                             |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   | 072100                    | <b>THERMAL INSULATION</b>                                  |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Test Reports                                       |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Research Reports   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   | 072119                    | <b>FOAMED-IN-PLACE INSULATION</b>                          |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Qualification Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Test Reports                                       |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Evaluation Reports   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   | 072713                    | <b>MODIFIED BITUMINOUS SHEET AIR BARRIERS</b>              |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Shop Drawings  |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Qualification Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Certificates                                       |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Test Reports                                       |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Field Quality-Control Reports                              |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   | 074213.23                 | <b>METAL COMPOSITE MATERIAL WALL PANELS</b>                |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data   |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |
|   |                           | Shop Drawings  |                          |              |                |      |            |          |             |                      |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG   |                           |   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|---|---------------------------|---|--------------------------|--------------|----------------------|------|------------|----------|-------------|----------|-------------------|-------------------|-------------|---------------|------------|-------|-------|------|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME |                           |   |                          |              | BGS PROJECT NO: 3676 |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| OWNER: BUREAU OF GENERAL SERVICES                                       |                           |   |                          |              | CONTRACTOR:          |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| DATE REC'D.   | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                                      | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER       |      |            |          |             | ACTION   |                   |                   |             | DATE RETURNED | COPIES TO  |       |       |      |
|   |                           |   |                          |              | DATE SENT            | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. |               | CONTRACTOR | OWNER | FIELD | FILE |
|   |                           | Samples for Initial Selection                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Test and Evaluation Reports                         |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Field Quality Control Reports                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Statements                            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Delegated Design Engineer Qualifications            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Sample Warranties                                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Maintenance Data                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Warranty Documentation                              |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 075419                    | POLYVINYL-CHLORIDE (PVC) ROOFING                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Samples for Verification                            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Wind Uplift Resistance Submittal                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Data                                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Manufacturer Certificates                           |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Test Reports                                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Field Quality-Control Reports                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Evaluation Reports                                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Sample Warranties                                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Maintenance Data                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Certified Statement from Roof Membrane Manufacturer |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 076200                    | SHEET METAL FLASHING AND TRIM                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Samples   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Data                                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Maintenance Data                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 077100                    | ROOF SPECIALTIES                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Samples   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Certificates                                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Test Reports                                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Research Reports                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Statements                            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|--|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |  |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM   | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |  |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Sample Warranties                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 078100                    | <b>APPLIED FIREPROOFING</b>                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Certificates                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Preconstruction Test Reports                           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 078123                    | <b>INTUMESCENT FIREPROOFING</b>                        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Certificates                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Evaluation Reports                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Preconstruction Test Reports                           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 078413                    | <b>PENETRATION FIRESTOPPING</b>                        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Schedule                                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Test and Inspection Report by Qualified Testing Agency |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Listed System Designs                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Installer Certificates                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Inspection Reports                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | As-Built Update of Product Schedule                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 078443                    | <b>JOINT FIRESTOPPING</b>                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Unlisted Firestopping Systems                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Schedule                                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Listed System Designs                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Installer Certificates                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG   |                           |   |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|---|---------------------------|---|--------------------------|--------------|----------------------|------|------------|----------|-------------|----------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME |                           |   |                          |              | BGS PROJECT NO: 3676 |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
| OWNER: BUREAU OF GENERAL SERVICES                                       |                           |   |                          |              | CONTRACTOR:          |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.   | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                            | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER       |      |            |          |             | ACTION   |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|   |                           |   |                          |              | DATE SENT            | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|   |                           | Product Test Reports                      |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Inspection Reports                        |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | As-Built Update of Product Schedule       |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   | 079100                    | PREFORMED JOINT SEALS                     |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data                              |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Samples for Initial Selection             |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Shop Drawings                             |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Sample Warranties                         |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   | 079200                    | JOINT SEALANTS                            |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data                              |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Samples for Initial Selection             |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Joint-Sealant Schedule                    |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Sample Warranties                         |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Manufacturer's Special Warranties         |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Installer's Special Warranties            |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   | 079219                    | ACOUSTICAL JOINT SEALANTS                 |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data                              |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Samples for Initial Selection             |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Acoustical Joint-Sealant Schedule         |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Test and Evaluation Reports               |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Sample Warranties                         |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Warranty Documentation                    |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   | 081113                    | HOLLOW METAL DOORS AND FRAMES             |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data                              |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Shop Drawings                             |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Schedule                          |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Qualification Data                        |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Test Reports                      |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Field Quality Control Reports             |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Record Documents                          |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   | 083113                    | ACCESS DOORS AND FRAMES                   |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Data                              |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Samples                                   |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   |                           | Product Schedule                          |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |
|   | 084113                    | ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS |                          |              |                      |      |            |          |             |          |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|---|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |   |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                                    | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |   |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Product Data                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Entrance Door Hardware Schedule                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Delegated Design Submittals                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product test Reports                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Source Quality-Control Reports                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Statements                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Delegated Design Engineer Qualifications          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warranties                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 085653                    | <b>SECURITY WINDOWS</b>                           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Delegated Design Submittal                        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Welding Certificates                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Test Reports                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Examination Reports                               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warranty                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 087111                    | <b>DOOR HARDWARE (DESCRIPTIVE SPECIFICATIONS)</b> |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Door Hardware Schedule                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Keying Schedule                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Certificates                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Test Reports                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warranty                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Final Schedules                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 087113                    | <b>POWER DOOR OPERATORS</b>                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG   |                           |  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|---|---------------------------|--|--------------------------|--------------|----------------------|------|------------|----------|-------------|----------|-------------------|-------------------|-------------|---------------|------------|-------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME |                           |  |                          |              | BGS PROJECT NO: 3676 |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
| OWNER: BUREAU OF GENERAL SERVICES                                       |                           |  |                          |              | CONTRACTOR:          |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
| DATE REC'D.   | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                           | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER       |      |            |          |             | ACTION   |                   |                   |             | DATE RETURNED | COPIES TO  |       |       |      |  |
|   |                           |  |                          |              | DATE SENT            | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. |               | CONTRACTOR | OWNER | FIELD | FILE |  |
|   |                           | Shop Drawings                            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Samples                                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Qualification Data                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Product Certificates                     |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Field Quality-Control Reports            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Sample Warranties                        |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Maintenance Data                         |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   | 088000                    | GLAZING                                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Product Data                             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Glass Samples                            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Glazing Accessory Samples                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Glazing Schedule                         |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Delegated Design Submittal               |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Qualification Data                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Product Test Reports                     |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Sample Warranties                        |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   | 088853                    | SECURITY GLAZING                         |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Product Data                             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Samples for Initial Selection            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Security Glazing Schedule                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Delegated Design Submittal               |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Test and Evaluation Reports              |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Qualification Statements                 |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Delegated Design Engineer Qualifications |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Sample Warranties                        |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   | 092116.23                 | GYPSUM BOARD SHAFT WALL ASSEMBLIES       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Product Data                             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Evaluation Reports                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   | 092216                    | NON-STRUCTURAL METAL FRAMING             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Product Data                             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Shop Drawings                            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Product Certificates                     |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Evaluation Reports                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   | 092900                    | GYPSUM BOARD                             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |
|   |                           | Product Data                             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |  |



SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|--|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |  |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM   | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |  |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Shop Drawings  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 093013                    | <b>CERAMIC TILING</b>  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Extra Stock Material (Tile and Trim Units; Grout)                        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 095113                    | <b>ACOUSTICAL PANEL CEILINGS</b>   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Coordination Drawings  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Extra Materials (Acoustical Ceiling Units; Suspension-System Components) |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 095426                    | <b>SUSPENDED WOOD CEILINGS</b>   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Coordination Drawings  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Certificates   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warranty  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 096340                    | <b>DIMENSION STONE FLOORING</b>  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Verification   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Material Test Reports  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 096513                    | <b>RESILIENT BASE AND ACCESSORIES</b>                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Extra Materials  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|------------------------------------|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |                                    |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                     | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |                                    |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  | <b>096519</b>             | <b>RESILIENT TILE FLOORING</b>     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Schedule                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Extra Materials (Floor Tile)       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>096813</b>             | <b>TILE CARPETING</b>              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Schedule                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Test Reports               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Statements           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warranties                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Extra Stock Material (Carpet Tile) |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>099123</b>             | <b>INTERIOR PAINTING</b>           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Schedule                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Extra Materials (Paint Products)   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>099600</b>             | <b>HIGH-PERFORMANCE COATINGS</b>   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product List                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>101200</b>             | <b>DISPLAY CASES</b>               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Test Reports               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | <b>101400</b>             | <b>SIGNAGE</b>                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|--|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |  |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                               | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |  |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Samples for Verification                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Schedule                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warranty                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Extra Materials                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 102641                    | <b>TSS BR FIBERGLASS PANELS</b>              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Test Reports                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Warranty                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 102800                    | <b>TOILET, BATH, AND LAUNDRY ACCESSORIES</b> |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Schedule                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warranty                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 104413                    | <b>FIRE PROTECTION CABINETS</b>              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples                                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Verification                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Schedule                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 104416                    | <b>FIRE EXTINGUISHERS</b>                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Warranty                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 111200                    | <b>TRAFFIC BARRIERS</b>                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG   |                           |  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|---|---------------------------|--|--------------------------|--------------|----------------------|------|------------|----------|-------------|----------|-------------------|-------------------|-------------|---------------|------------|-------|-------|------|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME |                           |  |                          |              | BGS PROJECT NO: 3676 |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| OWNER: BUREAU OF GENERAL SERVICES                                       |                           |  |                          |              | CONTRACTOR:          |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| DATE REC'D.   | SPECIFICATION SECTION NO. | SUBMITTAL ITEM   | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER       |      |            |          |             | ACTION   |                   |                   |             | DATE RETURNED | COPIES TO  |       |       |      |
|   |                           |  |                          |              | DATE SENT            | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. |               | CONTRACTOR | OWNER | FIELD | FILE |
|   |                           | Operation and Maintenance Data                                 |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 122413                    | ROLLER WINDOW SHADES   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Samples  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Statements                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Certificates   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Test Reports   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Operation and Maintenance Data                                 |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Extra Materials (Roller Shades)                                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 123623.13                 | PLASTIC-LAMINATE-CLAD COUNTERTOPS                              |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Samples for Initial Selection                                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Coordination Drawings  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Statements                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 123661.16                 | SOLID SURFACING COUNTERTOPS                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Samples for Initial Selection                                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Samples for Verification                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Data   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Maintenance Data   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 210500                    | COMMON WORK RESULTS FOR FIRE SUPPRESSION                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 210529                    | HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 210553                    | IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 211000                    | WATER-BASED FIRE-SUPPRESSION SYSTEMS                           |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|--|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |  |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM   | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |  |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Shop Drawings  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Delegated Design Submittals                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Coordination Drawings                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Design Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Test Reports                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Extra Materials  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 220500                    | COMMON WORK RESULTS FOR PLUMBING                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 220523                    | GENERAL-DUTY VALVES FOR PLUMBING PIPING                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 220529                    | HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 220553                    | IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Valve Schedules  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 220719                    | PLUMBING PIPING INSULATION                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Insulation Schedule                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 221116                    | DOMESTIC WATER PIPING                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | System Purging and Disinfecting Activities Report      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 221119                    | DOMESTIC WATER PIPING SPECIALTIES                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 221316                    | SANITARY WASTE AND VENT PIPING                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG   |                           |  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|---|---------------------------|--|--------------------------|--------------|----------------------|------|------------|----------|-------------|----------|-------------------|-------------------|-------------|---------------|------------|-------|-------|------|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME |                           |  |                          |              | BGS PROJECT NO: 3676 |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| OWNER: BUREAU OF GENERAL SERVICES                                       |                           |  |                          |              | CONTRACTOR:          |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| DATE REC'D.   | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                                     | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER       |      |            |          |             | ACTION   |                   |                   |             | DATE RETURNED | COPIES TO  |       |       |      |
|   |                           |  |                          |              | DATE SENT            | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. |               | CONTRACTOR | OWNER | FIELD | FILE |
|   |                           | Field Quality-Control Reports                      |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 221319                    | SANITARY WASTE PIPING SPECIALTIES                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 221319.13                 | SANITARY DRAINS                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 221329                    | SANITARY SEWERAGE PUMPS                            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                      |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Operation and Maintenance Data                     |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 221414                    | STORM DRAINAGE PIPING                              |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Field Quality-Control Reports                      |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 221423                    | STORM DRAINAGE PIPING SPECIALTIES                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 224200                    | COMMERCIAL PLUMBING FIXTURES                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                      |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Coordination Drawings                              |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Operation and Maintenance Data                     |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 230500                    | COMMON WORK RESULTS FOR HVAC                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 230523                    | GENERAL-DUTY VALVES FOR HVAC PIPING                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 230529                    | HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 230553                    | IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Valve Schedules                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 230593                    | TESTING, ADJUSTING, AND BALANCING FOR HVAC         |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Data                                 |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Contract Documents Examination Report              |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|---|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |   |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                                      | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |   |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Strategies and Procedures Plan                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Certified TAB Reports                               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Report Forms                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Instrument Calibration Reports                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 230713                    | <b>DUCT INSULATION</b>                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 230719                    | <b>HVAC PIPING INSULATION</b>                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 230923                    | <b>DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC</b> |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Software Submittal                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | System Description                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Delegated Design Submittals                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Statements                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Certificates                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 23092311                  | <b>CONTROL VALVES</b>                               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 230923.12                 | <b>CONTROL DAMPERS</b>                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 230923.27                 | <b>TEMPERATURE INSTRUMENTS</b>                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 232113                    | <b>HYDRONIC PIPING</b>                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 232116                    | <b>HYDRONIC PIPING SPECIALTIES</b>                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 233113                    | <b>METAL DUCTS</b>                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                              |   |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|--|------------------------------|---|-----------------------------|--------------|----------------|------|------------|-------------|----------------|-------------------------------------|----------------------|----------------------|-------------|------------|------------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                              |   |                             |              |                |      |            |             |                | BGS PROJECT NO: 3676<br>CONTRACTOR: |                      |                      |             |            |                  |           |       |      |  |
| DATE<br>REC'D.   | SPECIFICATION<br>SECTION NO. | SUBMITTAL ITEM  | CONTRACTOR<br>SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |             |                | ACTION                              |                      |                      |             |            | DATE<br>RETURNED | COPIES TO |       |      |  |
|  |                              |   |                             |              | DATE<br>SENT   | FIRM | NO. COPIES | DUE<br>DATE | DATE<br>REC'D. | APPROVED                            | APPROVED<br>AS NOTED | REVISE &<br>RESUBMIT | NOT APP' D. | CONTRACTOR |                  | OWNER     | FIELD | FILE |  |
|  | 233300                       | <b>AIR DUCT ACCESSORIES</b>   |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 233346                       | <b>FLEXIBLE DUCTS</b>   |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 233600                       | <b>AIR TERMINAL UNITS</b>   |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Operation and Maintenance Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 233713.13                    | <b>AIR DIFFUSERS</b>  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 233713.23                    | <b>REGISTERS AND GRILLES</b>  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 260010                       | <b>SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL</b>                               |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Coordination Drawings for Ceiling Areas                                       |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Coordination Drawings for Conduit Routing                                     |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Electrical Installation Schedule  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Installation Schedule for Communications Systems                              |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Installation Schedule for Security, Fire-Alarm, and Other Life-Safety Systems |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Welding Certificates  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Operation and Maintenance Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Software and Firmware Operational Documentation                               |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 260519                       | <b>LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES</b>                     |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Schedule  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Field Quality-Control Reports   |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 260523                       | <b>CONTROL-VOLTAGE ELECTRICAL POWER CABLES</b>                                |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  | 260526                       | <b>GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS</b>                           |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Product Data  |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |
|  |                              | Field Quality-Control Reports   |                             |              |                |      |            |             |                |                                     |                      |                      |             |            |                  |           |       |      |  |



SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG   |                              |  |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|---|------------------------------|--|-----------------------------|--------------|----------------------|------|------------|-------------|----------------|----------|----------------------|----------------------|-------------|------------------|------------|-------|-------|------|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME |                              |  |                             |              | BGS PROJECT NO: 3676 |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
| OWNER: BUREAU OF GENERAL SERVICES                                       |                              |  |                             |              | CONTRACTOR:          |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
| DATE<br>REC'D.  | SPECIFICATION<br>SECTION NO. | SUBMITTAL ITEM   | CONTRACTOR<br>SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER       |      |            |             |                | ACTION   |                      |                      |             | DATE<br>RETURNED | COPIES TO  |       |       |      |
|   |                              |  |                             |              | DATE<br>SENT         | FIRM | NO. COPIES | DUE<br>DATE | DATE<br>REC'D. | APPROVED | APPROVED<br>AS NOTED | REVISE &<br>RESUBMIT | NOT APP' D. |                  | CONTRACTOR | OWNER | FIELD | FILE |
|   | 260529                       | HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS                  |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Product Data   |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   | 260533.13                    | CONDUITS FOR ELECTRICAL SYSTEMS                              |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Product Data   |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Field Quality-Control Reports                                |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Manufacturer's Published Instructions                        |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   | 260533.16                    | BOXES AND COVERS FOR ELECTRICAL SYSTEMS                      |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Product Data   |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Manufacturer's Published Instructions                        |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   | 260543                       | UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS        |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Product Data   |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Field Quality-Control Reports                                |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Manufacturer's Published Instructions                        |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Field Reports  |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   | 260544                       | SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Product Data   |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   | 260553                       | IDENTIFICATION FOR ELECTRICAL SYSTEMS                        |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Product Data   |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Identification Schedule                                      |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   | 260923                       | LIGHTING CONTROL DEVICES                                     |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Product Data   |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Shop Drawings  |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Field Quality-Control Reports                                |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Manufacturer's Published Instructions                        |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Warranty Documentation                                       |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Software and Firmware Service Agreement                      |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   | 260936                       | MODULAR DIMMING CONTROLS                                     |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Product Data   |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |
|   |                              | Shop Drawings  |                             |              |                      |      |            |             |                |          |                      |                      |             |                  |            |       |       |      |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |                                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|---------------------------------------|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |                                       |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                        | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |                                       |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Field Quality-Control Reports         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warranty                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 260943.23                 | <b>RELAY-BASED LIGHTING CONTROLS</b>  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Panelboard Schedules                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Manufacturer's Published Instructions |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Reports                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Warranty Documentation                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 262416                    | <b>PANELBOARD CIRCUIT BREAKERS</b>    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product                               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product List                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Warranty                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Manufacturer's Field Reports          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Wiring diagrams                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 262726                    | <b>WIRING DEVICES</b>                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 262813                    | <b>FUSES</b>                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 262816                    | <b>ENCLOSED SWITCHES</b>              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Warranty Documentation                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 265000                    | <b>LIGHTING</b>                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Manufacturer's Published Instructions |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Reports                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Warranty Documentation                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG   |                           |   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|---|---------------------------|---|--------------------------|--------------|----------------------|------|------------|----------|-------------|----------|-------------------|-------------------|-------------|---------------|------------|-------|-------|------|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME |                           |   |                          |              | BGS PROJECT NO: 3676 |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| OWNER: BUREAU OF GENERAL SERVICES                                       |                           |   |                          |              | CONTRACTOR:          |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| DATE REC'D.   | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                                  | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER       |      |            |          |             | ACTION   |                   |                   |             | DATE RETURNED | COPIES TO  |       |       |      |
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|   | 270528                    | PATHWAYS FOR COMMUNICATIONS SYSTEMS             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Manufacturer's Published Instructions           |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 271100                    | COMMUNICATIONS EQUIPMENT ROOM FITTINGS          |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 271513                    | COMMUNICATIONS COPPER HORIZONTAL CABLING        |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Twisted Pair Cable Testing Plan                 |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Field Quality-Control Reports                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Data                              |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Certificates                            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Source Quality-Control Reports                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Maintenance Data                                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Software and Firmware Operational Documentation |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 281000                    | ACCESS CONTROL                                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Field Quality Control Reports                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Sample Warranty                                 |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Manufacturer's Published Instructions           |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Warranty Documentation                          |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 281400                    | ACCESS CONTROL SYSTEM HARDWARE                  |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Field Quality-Control Reports                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Manufacturer's Published Instructions           |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Warranty Documentation                          |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 281500                    | INTEGRATED ACCESS CONTROL HARDWARE DEVICES      |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                                    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Shop Drawings                                   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |

SECURITY SCREENING CENTERS  
STATE HOUSE AND BURTON M. CROSS OFFICE BUILDING  
AUGUSTA, MAINE

| MASTERWORKS SUBMITTAL LOG  |                           |   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|---|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |   |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                                  | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |   |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Manufacturer's Published Instructions           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warmties                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Contracts                           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Warranty Documentation                          |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Extra Stock Material (Devices and Accessories)  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 282000                    | <b>VIDEO SURVEILLANCE</b>                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Design Data                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Warranty                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 283100                    | <b>INTRUSION DETECTION</b>                      |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Design Data                                     |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Manufacturer's Published Instructions           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Reports                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 284621.11                 | <b>ADDRESSABLE FIRE-ALARM SYSTEMS</b>           |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Approved Permitting                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Delegated Design                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality Control Reports                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Statements                        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Sample Warranty                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Operation and Maintenance Data                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Software and Firmware Operational Documentation |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 311000                    | <b>SITE CLEARING</b>                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Record Drawings                                 |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 312000                    | <b>EARTH MOVING</b>                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

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| MASTERWORKS SUBMITTAL LOG  |                           |   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|--|---------------------------|---|--------------------------|--------------|----------------|------|------------|----------|-------------|-------------------------------------|-------------------|-------------------|-------------|------------|---------------|-----------|-------|------|--|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME<br>OWNER: BUREAU OF GENERAL SERVICES |                           |   |                          |              |                |      |            |          |             | BGS PROJECT NO: 3676<br>CONTRACTOR: |                   |                   |             |            |               |           |       |      |  |
| DATE REC'D.  | SPECIFICATION SECTION NO. | SUBMITTAL ITEM                                      | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER |      |            |          |             | ACTION                              |                   |                   |             |            | DATE RETURNED | COPIES TO |       |      |  |
|  |                           |   |                          |              | DATE SENT      | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED                            | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. | CONTRACTOR |               | OWNER     | FIELD | FILE |  |
|  |                           | Material Test Reports                               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 316216                    | <b>STEEL PILES</b>                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Qualification Data                                  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Welding Certificates                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Mill Test Reports                                   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Pile-Driving Equipment Data                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Static Pile Test Reports                            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Pile-Driving Records                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Certified Piles Survey                              |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Preconstruction Photographs                         |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 321216                    | <b>ASPHALT PAVING</b>                               |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Hot Mix Asphalt Delivery Tickets                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 323119                    | <b>DECORATIVE METAL FENCES AND GATES</b>            |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Shop Drawings                                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Test Reports                                |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 323300                    | <b>SITE FURNISHINGS</b>                             |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples for Initial Selection                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Maintenance Data                                    |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  | 329115                    | <b>SOIL PREPARATION (PERFORMANCE SPECIFICATION)</b> |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Product Data  |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Samples   |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Preconstruction Test Reports                        |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |
|  |                           | Field Quality-Control Reports                       |                          |              |                |      |            |          |             |                                     |                   |                   |             |            |               |           |       |      |  |

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| MASTERWORKS SUBMITTAL LOG   |                           |                             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|---|---------------------------|-----------------------------|--------------------------|--------------|----------------------|------|------------|----------|-------------|----------|-------------------|-------------------|-------------|---------------|------------|-------|-------|------|
| PROJECT: SECURITY SCREENING ADDITION, BURTON M. CROSS BLDG, AUGUSTA, ME |                           |                             |                          |              | BGS PROJECT NO: 3676 |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| OWNER: BUREAU OF GENERAL SERVICES                                       |                           |                             |                          |              | CONTRACTOR:          |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
| DATE REC'D.   | SPECIFICATION SECTION NO. | SUBMITTAL ITEM              | CONTRACTOR SUBCONTRACTOR | NO. RECEIVED | OTHER REVIEWER       |      |            |          |             | ACTION   |                   |                   |             | DATE RETURNED | COPIES TO  |       |       |      |
|   |                           |                             |                          |              | DATE SENT            | FIRM | NO. COPIES | DUE DATE | DATE REC'D. | APPROVED | APPROVED AS NOTED | REVISE & RESUBMIT | NOT APP' D. |               | CONTRACTOR | OWNER | FIELD | FILE |
|   | 329200                    | TURF AND GRASSES            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Data          |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Certification of Grass Seed |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Certificates        |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Pesticides and Herbicides   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Maintenance Data            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 329300                    | PLANTS                      |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Samples for Verification    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Qualification Statements    |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Certificates        |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Certificates        |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Pesticides and Herbicides   |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Maintenance Data            |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 334200                    | STORMWATER CONVEYANCE       |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Test Reports                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   | 334600                    | SUBDRAINAGE                 |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           | Product Data                |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |
|   |                           |                             |                          |              |                      |      |            |          |             |          |                   |                   |             |               |            |       |       |      |

END OF SECTION

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SECTION 013516 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes special procedures for alteration work.

1.2 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- F. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- G. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- H. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- I. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- J. Retain: To keep an element or detail secure and intact.
- K. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 COORDINATION

- A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.

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1. Schedule construction operations in sequence required to obtain best Work results.
  2. Coordinate sequence of alteration work activities to accommodate the following:
    - a. Owner's continuing occupancy of portions of existing building.
    - b. Other known work in progress.
    - c. Tests and inspections.
  3. Detail sequence of alteration work, with start and end dates.
  4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
  5. Use of elevator and stairs.
  6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.
- B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

#### 1.4 PROJECT MEETINGS FOR ALTERATION WORK

- A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.
1. Attendees: In addition to representatives of Owner, Architect, and Contractor, testing service representative, specialists, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
  2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:
    - a. Alteration Work Subschedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
    - b. Fire-prevention plan.
    - c. Governing regulations.
    - d. Areas where existing construction is to remain and the required protection.
    - e. Hauling routes.
    - f. Sequence of alteration work operations.
    - g. Storage, protection, and accounting for salvaged and specially fabricated items.
    - h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
    - i. Qualifications of personnel assigned to alteration work and assigned duties.
    - j. Requirements for extent and quality of work, tolerances, and required clearances.
    - k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.
  3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.



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1.5 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.
  - 1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed at Project site.

1.6 QUALITY ASSURANCE

- A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.
  - 1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
- B. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.
  - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
  - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- C. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.
- D. Safety and Health Standard: Comply with ANSI/ASSP A10.6.

1.7 STORAGE AND HANDLING OF SALVAGED MATERIALS

- A. Salvaged Materials:
  - 1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
  - 2. Pack or crate items after cleaning; cushion against damage during handling. Label

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- contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area on-site.
  - 5. Protect items from damage during transport and storage.
- B. Salvaged Materials for Reinstallation:
  - 1. Repair and clean items for reuse as indicated.
  - 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
  - 3. Protect items from damage during transport and storage.
  - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.
- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
  - 1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
  - 2. Secure stored materials to protect from theft.
  - 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.
- E. Storage Space:
  - 1. Owner will arrange for limited on-site location(s) for free storage of salvaged material. This storage space does not include security and climate control for stored material.
  - 2. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

## PART 2 - PRODUCTS - (Not Used)

## PART 3 - EXECUTION

### 3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
  - 1. Use only proven protection methods, appropriate to each area and surface being protected.
  - 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.

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3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.

B. Temporary Protection of Materials to Remain:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:

1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.

1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

### 3.2 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following:

1. Comply with NFPA 241 requirements unless otherwise indicated.
2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
  - a. If combustible material cannot be removed, provide fire blankets to cover such materials.

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- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
  2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
  3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
  4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
  5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
  6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
    - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

### 3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.

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- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

### 3.4 GENERAL ALTERATION WORK

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs. Comply with requirements in Section 013233 "Photographic Documentation."
- D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
  - 1. Do not proceed with the work in question until directed by Architect.

END OF SECTION

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

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- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
  - 1. Mockups are used for one or more of the following:
    - a. Verify selections made under Sample submittals.
    - b. Demonstrate aesthetic effects.
    - c. Demonstrate the qualities of products and workmanship.
    - d. Demonstrate successful installation of interfaces between components and systems.
    - e. Perform preconstruction testing to determine system performance.
  - 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
  - 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

#### 1.4 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.



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1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### 1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- C. Qualification Data: For Contractor's quality-control personnel.
- D. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
  1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
  2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- E. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.



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- F. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Entity responsible for performing tests and inspections.
  - 3. Description of test and inspection.
  - 4. Identification of applicable standards.
  - 5. Identification of test and inspection methods.
  - 6. Number of tests and inspections required.
  - 7. Time schedule or time span for tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.
- G. Reports: Prepare and submit certified written reports and documents as specified.
- H. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

#### 1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
  - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
  - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
  - 3. Owner-performed tests and inspections indicated in the Contract Documents.

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- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, telephone number, and email address of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, telephone number, and email address of technical representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Statement that products at Project site comply with requirements.
  - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  - 6. Statement of whether conditions, products, and installation will affect warranty.
  - 7. Other required items indicated in individual Specification Sections.

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- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, telephone number, and email address of factory-authorized service representative making report.
  - 2. Statement that equipment complies with requirements.
  - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  - 4. Statement of whether conditions, products, and installation will affect warranty.
  - 5. Other required items indicated in individual Specification Sections.

## 1.9 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
  - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- F. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

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- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups of size indicated.
  - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
  - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
  - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  - 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
  - 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 10. Demolish and remove mockups when directed unless otherwise indicated.

#### 1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
  - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
  - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

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2. Engage a qualified testing agency to perform quality-control services.
    - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.

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2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  6. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
  2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

##### 3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.

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

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

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SECTION 014200 - REFERENCES

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 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms, including "requested," "authorized," "selected," "required," and "permitted," have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms, including "shown," "noted," "scheduled," and "specified," have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.



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- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
  - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### 1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations, List: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.
  - 1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
  - 2. AAMA - American Architectural Manufacturers Association; (see FGIA).
  - 3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
  - 4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
  - 5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
  - 6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
  - 7. ABMA - American Boiler Manufacturers Association; [www.abma.com](http://www.abma.com).
  - 8. ACI - American Concrete Institute; [www.concrete.org](http://www.concrete.org).
  - 9. ACP - American Clean Power; (Formerly: American Wind Energy Association); [www.cleanpower.org](http://www.cleanpower.org).
  - 10. ACPA - American Concrete Pipe Association; [www.concretepipe.org](http://www.concretepipe.org).
  - 11. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
  - 12. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
  - 13. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
  - 14. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
  - 15. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
  - 16. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
  - 17. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
  - 18. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
  - 19. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
  - 20. AITC - American Institute of Timber Construction; (see PLIB).
  - 21. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
  - 22. AMPP - Association for Materials Protection and Performance; [www.ampp.org](http://www.ampp.org).
  - 23. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
  - 24. AOSA/SCST - Association of Official Seed Analysts (The)/Society of Commercial Seed

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- Technologists (The); [www.analyze-seeds.com](http://www.analyze-seeds.com).
25. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
  26. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
  27. API - American Petroleum Institute; [www.api.org](http://www.api.org).
  28. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
  29. ASA - Acoustical Society of America; [www.acousticalsociety.org](http://www.acousticalsociety.org).
  30. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
  31. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (see ASCE).
  32. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
  33. ASME - ASME International; American Society of Mechanical Engineers (The); [www.asme.org](http://www.asme.org).
  34. ASSE - ASSE International; (American Society of Sanitary Engineering); [www.asse-plumbing.org](http://www.asse-plumbing.org).
  35. ASSP - American Society of Safety Professionals; [www.assp.org](http://www.assp.org).
  36. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
  37. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
  38. AVIXA - Audiovisual and Integrated Experience Association; [www.avixa.org](http://www.avixa.org).
  39. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
  40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
  41. AWWPA - American Wood Protection Association; [www.awpa.com](http://www.awpa.com).
  42. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
  43. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
  44. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
  45. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
  46. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
  47. BIFMA - Business and Institutional Furniture Manufacturer's Association; [www.bifma.org](http://www.bifma.org).
  48. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
  49. BSI - British Standards Institution; [www.bsigroup.com](http://www.bsigroup.com).
  50. BWF - Badminton World Federation; [www.bwfbadminton.com](http://www.bwfbadminton.com).
  51. CARB - California Air Resources Board; [www.arb.ca.gov](http://www.arb.ca.gov).
  52. CDA - Copper Development Association Inc.; [www.copper.org](http://www.copper.org).
  53. CE - Conformite Europeenne (European Commission); [www.ec.europa.eu/growth/single-market/ce-marking](http://www.ec.europa.eu/growth/single-market/ce-marking).
  54. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
  55. CFFA - Chemical Fabrics and Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
  56. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
  57. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
  58. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
  59. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
  60. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
  61. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
  62. CMHA - Concrete Masonry & Hardscape Association; (Formerly: National Concrete Masonry Association); [www.masonryandhardscapes.org](http://www.masonryandhardscapes.org).
  63. CPA - Composite Panel Association; [www.compositepanel.org](http://www.compositepanel.org).
  64. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
  65. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).
  66. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).

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67. CSA - CSA Group; [www.csagroup.org](http://www.csagroup.org).
68. CSI - Cast Stone Institute; [www.caststone.org](http://www.caststone.org).
69. CSI - Construction Specifications Institute (The); [www.csiresources.org](http://www.csiresources.org).
70. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
71. CTA - Consumer Technology Association; [www.cta.tech](http://www.cta.tech).
72. CTI - Cooling Technology Institute; [www.coolingtechnology.org](http://www.coolingtechnology.org).
73. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
74. DHA - Decorative Hardwoods Association; [www.decorativehardwoods.org](http://www.decorativehardwoods.org).
75. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
76. ECIA - Electronic Components Industry Association; [www.ecianow.org](http://www.ecianow.org).
77. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
78. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
79. EOS/ESD - EOS/ESD Association, Inc.; Electrostatic Discharge Association; [www.esda.org](http://www.esda.org).
80. ESTA - Entertainment Services and Technology Association; [www.esta.org](http://www.esta.org).
81. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
82. FCI - Fluid Controls Institute; [www.fluidcontrolsinstitute.org](http://www.fluidcontrolsinstitute.org).
83. FGIA - Fenestration and Glazing Industry Alliance; <https://fgiaonline.org>.
84. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); [www.fiba.com](http://www.fiba.com).
85. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); [www.fivb.org](http://www.fivb.org).
86. FM Approvals - FM Approvals LLC; [www.fmapprovals.com](http://www.fmapprovals.com).
87. FM Global - FM Global; [www.fmglobal.com](http://www.fmglobal.com).
88. FRSA - Florida Roofing and Sheet Metal Contractors Association, Inc.; [www.floridarroof.com](http://www.floridarroof.com).
89. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
90. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
91. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
92. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
93. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
94. HMMA - Hollow Metal Manufacturers Association; (see NAAMM).
95. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
96. IAS - International Accreditation Service; [www.iasonline.org](http://www.iasonline.org).
97. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
98. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
99. ICPA - International Cast Polymer Association (The); [www.theicpa.com](http://www.theicpa.com).
100. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
101. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
102. IEEE SA - IEEE Standards Association; <https://standards.ieee.org>.
103. IES - Illuminating Engineering Society; [www.ies.org](http://www.ies.org).
104. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
105. IGMMA - Insulating Glass Manufacturers Alliance; (see FGIA).
106. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.org](http://www.igshpa.org).
107. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).
108. Intertek - Intertek Group; [www.intertek.com](http://www.intertek.com).
109. ISA - International Society of Automation (The); [www.isa.org](http://www.isa.org).
110. ISFA - International Surface Fabricators Association; [www.isfanow.org](http://www.isfanow.org).
111. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
112. ITU - International Telecommunication Union; [www.itu.int](http://www.itu.int).
113. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).

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114. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
115. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
116. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
117. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
118. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
119. MHI - Material Handling Industry; [www.mhi.org](http://www.mhi.org).
120. MMPA - Moulding & Millwork Producers Association; [www.wmmpa.com](http://www.wmmpa.com).
121. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
122. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry, Inc.; [www.msshq.org](http://www.msshq.org).
123. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
124. NACE - NACE International; (National Association of Corrosion Engineers International); (see AMPP).
125. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
126. NAIMA - North American Insulation Manufacturers Association; [www.insulationinstitute.org](http://www.insulationinstitute.org).
127. NALP - National Association of Landscape Professionals; [www.landscapeprofessionals.org](http://www.landscapeprofessionals.org).
128. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
129. NBI - New Buildings Institute; [www.newbuildings.org](http://www.newbuildings.org).
130. NCAA - National Collegiate Athletic Association (The); [www.ncaa.org](http://www.ncaa.org).
131. NCMA - National Concrete Masonry Association; (see CMHA).
132. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
133. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
134. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
135. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
136. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
137. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
138. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
139. NFPA - NFPA International; (see NFPA).
140. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
141. NGA - National Glass Association; [www.glass.org](http://www.glass.org).
142. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
143. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
144. NOFMA - National Oak Flooring Manufacturers Association; (see NWFA).
145. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
146. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
147. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
148. NSF - NSF International; [www.nsf.org](http://www.nsf.org).
149. NSI - Natural Stone Institute; [www.naturalstoneinstitute.org](http://www.naturalstoneinstitute.org).
150. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
151. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
152. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
153. NWFA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).
154. NWRA - National Waste & Recycling Association; [www.wasterecycling.org](http://www.wasterecycling.org).
155. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
156. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
157. PLASA - PLASA; [www.plasa.org](http://www.plasa.org).
158. PLIB - Pacific Lumber Inspection Bureau; [www.plib.org](http://www.plib.org).
159. PVCPA - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).

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160. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
161. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
162. RIS - Redwood Inspection Service; (see WWPA).
163. SAE - SAE International; [www.sae.org](http://www.sae.org).
164. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
165. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
166. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
167. SEFA - Scientific Equipment and Furniture Association (The); [www.sefalabs.com](http://www.sefalabs.com).
168. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (see ASCE).
169. SIA - Security Industry Association; [www.securityindustry.org](http://www.securityindustry.org).
170. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
171. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
172. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
173. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
174. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
175. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
176. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
177. SRCC - Solar Rating & Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
178. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
179. SSPC - SSPC: The Society for Protective Coatings; (see AMPP).
180. STI/SPFA - Steel Tank Institute/Steel Plate Fabricators Association; [www.steeltank.com](http://www.steeltank.com).
181. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
182. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
183. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
184. TCNA - Tile Council of North America, Inc.; [www.tcnatile.com](http://www.tcnatile.com).
185. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.kbcdco.tema.org](http://www.kbcdco.tema.org).
186. TIA - Telecommunications Industry Association; [www.tiaonline.org](http://www.tiaonline.org).
187. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
188. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
189. TPI - Turfgrass Producers International; [www.turfgrasssod.org](http://www.turfgrasssod.org).
190. TRI - Tile Roofing Industry Alliance; [www.tilerroofing.org](http://www.tilerroofing.org).
191. ULSE - UL Standards & Engagement Inc.; [www.ulse.org](http://www.ulse.org).
192. UL - UL Solutions Inc.; [www.ul.com](http://www.ul.com).
193. USAV - USA Volleyball; [www.usavolleyball.org](http://www.usavolleyball.org).
194. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
195. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).
196. WA - Wallcoverings Association; [www.wallcoverings.org](http://www.wallcoverings.org).
197. WCLIB - West Coast Lumber Inspection Bureau; (see PLIB).
198. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
199. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
200. WI - Woodwork Institute; [www.woodworkinstitute.com](http://www.woodworkinstitute.com).
201. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
202. WWPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

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

1. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).



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2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. CPSC - U.S. Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
2. DOC - U.S. Department of Commerce; [www.commerce.gov](http://www.commerce.gov).
3. DOD - U.S. Department of Defense; [www.defense.gov](http://www.defense.gov).
4. DOE - U.S. Department of Energy; [www.energy.gov](http://www.energy.gov).
5. DOJ - U.S. Department of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
6. DOS - U.S. Department of State; [www.state.gov](http://www.state.gov).
7. EPA - United States Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
8. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
9. GPO - U.S. Government Publishing Office; [www.gpo.gov](http://www.gpo.gov).
10. GSA - U.S. General Services Administration; [www.gsa.gov](http://www.gsa.gov).
11. HUD - U.S. Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
12. LBNL - Lawrence Berkeley National Laboratory; Energy Technologies Area; [www.lbl.gov/](http://www.lbl.gov/).
13. NIST - National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
14. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
15. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; [www.trb.org](http://www.trb.org).
16. USACE - U.S. Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
17. USDA - U.S. Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
18. USDA - U.S. Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).
19. USP - U.S. Pharmacopeial Convention; [www.usp.org](http://www.usp.org).
20. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from U.S. Government Publishing Office; [www.govinfo.gov](http://www.govinfo.gov).
2. DOD - U.S. Department of Defense; Military Specifications and Standards; Available from DLA Document Services; [www.dsp.dla.mil/Specs-Standards/](http://www.dsp.dla.mil/Specs-Standards/).
3. DSCC - Defense Supply Center Columbus; (see FS).
4. FED-STD - Federal Standard; (see FS).
5. FS - Federal Specification; Available from DLA Document Services; [www.dsp.dla.mil/Specs-Standards/](http://www.dsp.dla.mil/Specs-Standards/).
  - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
  - b. Available from U.S. General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org](http://www.wbdg.org).

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6. MILSPEC - Military Specifications and Standards; (see DOD).
7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (see USAB).

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

1. BEARHFTI; California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; (see BHGS).
2. BHGS; State of California Bureau of Household Goods and Services; (Formerly: California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation); [www.bhgs.dca.ca.gov](http://www.bhgs.dca.ca.gov).
3. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.oal.ca.gov/publications/ccr/](http://www.oal.ca.gov/publications/ccr/).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; [www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx](http://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx).
5. CPUC; California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
6. SCAQMD; South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; <https://tfsweb.tamu.edu/>.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 014535 - SPECIAL INSPECTIONS

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 GENERAL REQUIREMENTS

- A. Perform Special Inspections in accordance with the Schedule of Special Inspections and Chapter 17 of ICC IBC. The Schedule of Special Inspections are included as an attachment to this specification. Special Inspections are to be performed by an independent third party and are intended to ensure that the work of the Prime Contractor is in accordance with the Contract Documents and applicable building codes. Special inspections do not take the place of the three phases of control inspections performed by the Contractor's QC Manager or any testing and inspections required by other sections of the specifications.

1.3 DEFINITIONS

- A. Continuous Special Inspections: Continuous Special Inspections is the constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks
- B. Perform: Perform these Special Inspections tasks for each welded joint or member.
- C. Observe: Observe these Special Inspections items on a periodic daily basis. Operations need not be delayed pending these inspections.
- D. Special Inspector (SI): A qualified person retained by the Contractor and approved by the Owner as having the competence necessary to inspect a particular type of construction requiring Special Inspections. The SI must be an independent third party hired directly by the Prime Contractor.
- E. Associate Special Inspector (ASI): A qualified person who assists the SI in performing Special Inspections but must perform inspection under the direct supervision of the SI and cannot perform inspections without the SI on site.
- F. Third Party: A Special inspector must not be an employee of the Contractor or of any Sub-Contractor performing the work to be inspected.
- G. Special Inspector of Record (SIOR): A licensed engineer in responsible charge of supervision of all special inspectors for the project and approved by the Owner. The SIOR must be an independent third party entity hired directly by the Prime Contractor.



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- H. Contractor's Quality Control (QC) Manager: An individual retained by the Prime Contractor and qualified in accordance with the Section 01 40 00 QUALITY REQUIREMENTS having the overall responsibility for the Contractor's QC organization.
- I. Structural Engineer of Record (SER): A registered design professional contracted by the Owner as an A/E responsible for the overall design and review of submittal documents prepared by others. The SER is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws in the state in which the design professional works. The SER is also referred to as the Engineer of Record (EOR) in design code documents.
- J. Schedule of Special Inspections (SSI): A schedule which lists each of the required Special Inspections, the extent to which each Special Inspection is to be performed, and the required frequency for each in accordance with ICC IBC Chapter 17. This schedule is included at the end of this specification.

#### 1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Preconstruction Submittals:
  - 1. SIOR Letter of Acceptance.
  - 2. Special Inspections Project Manual.
  - 3. Special Inspections Agency's Written NDT Practices with method and evidence of regular equipment calibration where applicable.
- C. Test Reports:
  - 1. Special Inspections Daily Reports.
  - 2. Special Inspections Biweekly Reports.
- D. Certificates:
  - 1. AISC Certified Steel Fabricator
  - 2. Certificate of Compliance
  - 3. Special Inspector of Record Qualifications
  - 4. Special Inspector Qualifications
  - 5. Qualification Records for NDT technicians

#### 1.5 SPECIAL INSPECTOR QUALIFICATIONS

- A. Submit qualifications for each special inspector and the special inspector of record.
  - 1. Steel Construction and High Strength Bolting
    - a. Special Inspector:

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- 1) ICC Structural Steel and Bolting Special Inspector certificate with one year of related experience, or
    - 2) Registered Professional Engineer with three years of related experience.
  - b. Associate Special Inspector: Engineer-in-Training with one year of related experience.
2. Welding Structural Steel
- a. Special Inspector:
    - 1) ICC Structural Welding Special Inspector certificate with one year of related experience, or
    - 2) b. AWS Certified Welding Inspector
  - b. Associate Special Inspector: AWS Certified Associate Welding Inspector
3. Nondestructive Testing of Welds:
- a. Special Inspector: NDT Level III Certificate.
  - b. Associate Special Inspector: NDT Level II Certificate plus one year of related experience.
4. Concrete Construction:
- a. Special Inspector:
    - 1) ICC Reinforced Concrete Special Inspector Certificate with one year of related experience, or
    - 2) ACI Concrete Construction Special Inspector, or
    - 3) Registered Professional Engineer with three years of related experience
  - b. Associate Special Instructor:
    - 1) ACI Concrete Construction Special Inspector in Training, or
    - 2) Engineer-In-Training with one year of related experience
5. Verification of Site Soil Condition, Fill Placement and Load-Bearing Requirements
- a. Special Inspector:
    - 1) ICC Soils Special Inspector Certificate with one year of related experience, or
    - 2) NICET Soils Technician Level II Certificate in Construction Material Testing, or
    - 3) Geologist-In-Training with three years of related experience, or
    - 4) Registered Professional Engineer with three years of related experience.
  - b. Associate Special Inspector:

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- 1) NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or
  - 2) Engineer-In-Training with one year of related experience
6. Deep Foundations:
- a. Special Inspector:
    - 1) NICET Soils Technician Level II Certificate in Construction Material Testing, or
    - 2) Geologist-In-Training with three years of related experience, or
    - 3) Registered Professional Engineer with three years of related experience.
  - b. Associate Special Inspector:
    - 1) NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or
    - 2) NICET Geotechnical Engineering Technician Level I Construction or Generalist Certificate with one year of related experience, or
    - 3) Engineer-In-Training with one year of related experience.
7. Sprayed Fire Resistant Material:
- a. Special Inspector:
    - 1) ICC Spray-applied Fireproofing Special Inspector Certificate, or
    - 2) ICC Fire Inspector I Certificate with one year of related experience, or
    - 3) Registered Professional Engineer or Architect with related experience.
  - b. Associate Special Inspector: Engineer-In-Training with one year of related experience.
8. Mastic and Intumescent Fire Resistant Coatings
- a. Special Inspector:
    - 1) ICC Spray-applied Fireproofing Special Inspector Certificate, or
    - 2) ICC Fire Inspector I Certificate with one year of related experience, or
    - 3) Registered Professional Engineer or Architect with related experience.
  - b. Associate Special Inspector: Engineer-In-Training with one year of related experience.
9. Fire-Resistant Penetrations and Joints:
- a. Special Inspector:
    - 1) Passed the UL Firestop Exam with one year of related experience, or
    - 2) Passed the FM Firestop Exam with one year of related experience, or
    - 3) Registered Professional Engineer with related experience.

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- b. Associate Special Inspector: Engineer-In-Training with one year of related experience.

## PART 2 - PRODUCTS

### 2.1 FABRICATOR SPECIAL INSPECTIONS

- A. Special Inspections of fabricator's work performed in the fabricator's shop is required to be inspected in accordance with the Schedule of Special Inspections unless the fabricator is certified by the approved agency to perform such work without Special Inspections. Submit the following certification to the Owner for information to allow work performed in the fabricator's shop to not be subjected to Special Inspections.

AISC Certified Steel Fabricator.

At the completion of fabrication, submit a certificate of compliance, to be included with the comprehensive final report of Special Inspections, stating that the materials supplied and work performed by the fabricator are in accordance with the construction documents.

## PART 3 - EXECUTION

### 3.1 RESPONSIBILITIES

- A. Special Inspector of Record:
  - 1. Supervise all Special Inspectors required by the Contract Documents and the IBC.
  - 2. Submit a SIOR Letter of Acceptance to the Owner attesting to acceptance of the duties of SIOR, signed and sealed by the SIOR.
  - 3. Verify the qualifications of all of the Special Inspectors.
  - 4. Verify the qualifications of fabricators.
  - 5. Submit Special Inspections agency's written NDT practices for the monitoring and control of the agency's operations to include the following:
    - a. The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel.
    - b. The agency's inspection procedures, including general inspection, material controls, and visual welding inspection.
  - 6. Submit qualification records for nondestructive testing (NDT) technicians designated for the project.
  - 7. Submit NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.
  - 8. Prepare a Special Inspections Project Manual, which must cover the following:

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- a. Roles and responsibilities of the following individuals during Special Inspections: SIOR, SI, ASI, General Contractor's QC Manager and SER.
- b. Organizational chart or communication plan, indicating lines of communication.
- c. Contractor's internal plan for scheduling inspections. Address items such as timeliness of inspection requests, who to contact for inspection requests, and availability of alternate inspectors.
- d. Propose forms or templates to be used by SI and SIOR to document inspections.
- e. Indicate procedures for tracking nonconforming work and verification that corrective work is complete.
- f. Indicate how the SIOR and SI will participate in weekly QC meetings.
- g. Indicate how Special Inspections of shop fabricated items will be handled when the fabricator's shop is not certified in accordance with paragraph FABRICATOR SPECIAL INSPECTIONS.
- h. Include a section in the manual that covers each specific item requiring Special Inspections that is indicated on the Schedule of Special Inspections. Provide names and qualifications of each special inspector who will be performing the Special Inspections for each specific item. Provide detail on how the Special Inspections are to be carried out for each item so that the expectations are clear for the General Contractor and the Subcontractor performing the work.

Make a copy of the Special Inspections Project Manual available on the job site during construction. Submit a copy of the Special Inspections Project Manual for approval.

9. Attend coordination and mutual understanding meeting where the information in the Special Inspections Project Manual will be reviewed to verify that all parties have a clear understanding of the Special Inspections provisions and the individual duties and responsibilities of each party.
10. Maintain a 3-ring binder for the Special Inspector's daily and biweekly reports and the Special Inspections Project Manual. This file must be located in a conspicuous place in the project trailer/office to allow review by the Owner and the SER.
11. Submit a copy of the Special Inspector's daily reports to the QC Manager.
12. Discrepancies that are observed during Special Inspections must be reported to the QC Manager for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report.
13. Submit a biweekly Special Inspections report until all work requiring Special Inspections is complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:
  - a. A brief summary of the work performed during the reporting time frame.
  - b. Changes and discrepancies with the drawings, specifications that were observed during the reporting period.
  - c. Discrepancies which were resolved or corrected.
  - d. A list of nonconforming items requiring resolution.
  - e. All applicable test results including nondestructive testing reports.

B. Quality Control Manager:

1. Supervise all Special Inspectors required by the Contract Documents and the IBC.
2. Verify the qualifications of all of the Special Inspectors.
3. Verify the qualifications of fabricators.

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4. Maintain a 3-ring binder for the Special Inspector's daily and biweekly reports. This file must be located in a conspicuous place in the project trailer/office to allow review by the Owner and the SER.
5. Maintain a rework items list that includes discrepancies noted on the Special Inspectors daily report.

C. Special Inspectors:

1. Inspect all elements of the project for which the special inspector is qualified to inspect and are identified in the Schedule of Special Inspections.
2. Attend preparatory phase meetings related to the Definable Feature of Work (DFOW) for which the special inspector is qualified to inspect.
3. Submit Special Inspections agency's written NDT practices for the monitoring and control of the agency's operations to include the following:
  - a. The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel.
  - b. The agency's inspection procedures, including general inspection, material controls, and visual welding inspection.
4. Submit qualification records for nondestructive testing (NDT) technicians designated for the project.
5. Submit NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.
6. Submit a copy of the daily reports to the QC Manager.
7. Report discrepancies that are observed during Special Inspections to the QC Manager for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report.
8. Submit a biweekly Special Inspection Report until all inspections are complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:
  - a. A brief summary of the work performed during the reporting time frame.
  - b. Changes and discrepancies with the drawings, specifications and mechanical or electrical component certification that were observed during the reporting period.
  - c. Discrepancies which were resolved or corrected.
  - d. A list of nonconforming items requiring resolution.
  - e. All applicable test results including nondestructive testing reports.

### 3.2 DETECTIVE WORK

- A. Check work as it progresses, but failure to detect any defective work or materials must in no way prevent later rejection if defective work or materials are discovered, nor obligate the Owner to accept such work.

END OF SECTION



OAK POINT  
ASSOCIATES

architecture  
engineering  
planning

## **Statement of Special Inspections**

Project: Security Screening Centers, State House and Burton M. Cross Office Building

Location: Augusta, Maine 04330

Owner: State of Maine BGS

Structural Engineer of Record: Benjamin D. Heidebrink, P.E.

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This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of Chapter 17 of the IBC 2015 Building Code. It includes a Schedule of Special Inspection Services applicable to this project, definitions, qualifications, and responsibilities of Special Inspection personnel, as well as the name of the Special Inspector of Record (SIOR) and the identity of other approved agencies to be retained for conducting these inspections and tests.

This Statement of Special Inspections encompass the following disciplines:

### **Structural:**

The SIOR shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Structural Engineer of Record (SER). Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the SER.

The Special Inspection program does not relieve the Contractor of his or her responsibilities and specified quality control tests and inspections. Special Inspectors shall not be the same personnel performing contractor quality control tests and inspections.

Interim reports shall be submitted to the Building Official and the SER every two weeks.

A Final Report of Special Inspections documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy. The final Special Inspection Report shall be signed and sealed by the SIOR.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

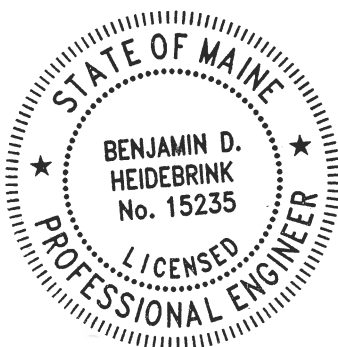
Prepared by:



Benjamin D. Heidebrink, P.E.

Signature Date: 1/2/2025

Design Professional Seal



Owner's Authorization: \_\_\_\_\_

Signature Date: \_\_\_\_\_

Building Official's Acceptance: \_\_\_\_\_

Signature Date: \_\_\_\_\_



## 1.1 DEFINITIONS

- A. Continuous Special Inspections: Continuous Special Inspections is the constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks.
- B. Perform: Perform these Special Inspections tasks for each welded joint or member.
- C. Observe: Observe these Special Inspections items on a periodic daily basis. Operations need not be delayed pending these inspections.
- D. Special Inspector (SI): A qualified person retained by the owner as having the competence necessary to inspect a particular type of construction requiring Special Inspections. The SI must be an independent third party hired directly by the owner.
- E. Associate Special Inspector (ASI): A qualified person who assists the SI in performing Special Inspections but must perform inspections under the direct supervision of the SI or SIOR.
- F. Third Party: A Special inspector must not be an employee of the Contractor or of any Sub-Contractor performing the work to be inspected. Personnel performing special inspections must not be performing any other quality control tests or inspections. Special inspectors may be employed by the quality control testing/inspection agency but must not be the same personnel performing quality control tests and inspections.
- G. Special Inspector of Record (SIOR): A licensed professional engineer in the State of Maine responsible charge of supervision of all special inspectors for the project and approved by the Owner. The SIOR must be an independent third-party entity hired directly by the Owner.
- H. Structural Engineer of Record (SER): A licensed professional engineer licensed in the State of Maine contracted by the Owner as an A/E responsible for the overall design and review of submittal documents prepared by others. The SER is licensed to practice their respective design profession as defined by the statutory requirements of the professional licensing laws in the State of Maine.

## 1.2 SPECIAL INSPECTOR QUALIFICATIONS

- A. Submit qualifications for each special inspector, associate special inspector and the special inspector of record.
  - 1. Steel Construction and High Strength Bolting
    - a. Special Inspector:
      - 1) ICC Structural Steel and Bolting Special Inspector certificate with one year of related experience, or
      - 2) Licensed Professional Engineer with three years of related experience.
    - b. Associate Special Inspector: Engineer-in-Training with one year of related experience.
  - 2. Welding Structural Steel
    - a. Special Inspector:

- 1) ICC Structural Welding Special Inspector certificate with one year of related experience, or
  - 2) AWS Certified Welding Inspector
- b. Associate Special Inspector: AWS Certified Associate Welding Inspector
3. Concrete Construction:
  - a. Special Inspector:
    - 1) ICC Reinforced Concrete Special Inspector Certificate with one year of related experience, or
    - 2) ACI Concrete Construction Special Inspector, or
    - 3) Licensed Professional Engineer with three years of related experience.
  - b. Associate Special Inspector:
    - 1) ACI Concrete Construction Special Inspector in Training, or
    - 2) Engineer-In-Training with one year of related experience
4. Verification of Site Soil Condition, Fill Placement and Load-Bearing Requirements
  - a. Special Inspector:
    - 1) ICC Soils Special Inspector Certificate with one year of related experience, or
    - 2) NICET Soils Technician Level II Certificate in Construction Material Testing, or
    - 3) Geologist-In-Training with three years of related experience, or
    - 4) Licensed Professional Engineer with three years of related experience.
  - b. Associate Special Inspector:
    - 1) NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or
    - 2) Engineer-In-Training with one year of related experience
5. Deep Foundations:
  - a. Special Inspector:
    - 1) NICET Soils Technician Level II Certificate in Construction Material Testing, or
    - 2) Geologist-In-Training with three years of related experience, or
    - 3) Registered Professional Engineer with three years of related experience.
  - b. Associate Special Inspector:
    - 1) NICET Soils Technician Level 1 Certificate in Construction Material Testing with one year of related experience, or
    - 2) NICET Geotechnical Engineering Technician Level 1 Construction or Generalist Certificate with one year of related experience, or
    - 3) Engineer-In-Training with one year of related experience.

### 1.3 RESPONSIBILITIES

#### A. Special Inspector of Record:

1. Supervise all Special Inspectors required by the Contract Documents and the IBC.
2. Submit a SIOR Letter of Acceptance to the Owner attesting to acceptance of the duties of SIOR, signed and sealed by the SIOR.
3. Verify the qualifications of all of the Special Inspectors.
4. Verify the qualifications of fabricators.
5. Submit Special Inspections agency's written NDT practices for the monitoring and control of the agency's operations to include the following:
  - a. The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel.
  - b. The agency's inspection procedures, including general inspection, material controls, and visual welding inspection.
6. Prepare a Special Inspections Project Manual, which must cover the following:
  - a. Roles and responsibilities of the following individuals during Special Inspections: SIOR, SI, ASI, General Contractor's QC Manager, and SER.
  - b. Organizational chart or communication plan, indicating lines of communication.
  - c. Indicate procedures for tracking nonconforming work and verification that corrective work is complete.
7. Attend coordination and mutual understanding meeting where the information in the Special Inspections Project Manual will be reviewed to verify that all parties have a clear understanding of the Special Inspections provisions and the individual duties and responsibilities of each party.
8. Maintain a 3-ring binder for the Special Inspector's daily and biweekly reports and the Special Inspections Project Manual.
9. Discrepancies that are observed during Special Inspections must be reported to the contractor for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report.
10. Submit a biweekly Special Inspections report until all work requiring Special Inspections is complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:
  - a. A brief summary of the work performed during the reporting time frame.
  - b. Changes and discrepancies with the drawings and specifications that were observed during the reporting period.
  - c. Discrepancies which were resolved or corrected.
  - d. A list of nonconforming items requiring resolution.
  - e. All applicable test results.

#### B. Quality Control Manager:

1. Supervise all Special Inspectors required by the Contract Documents and the IBC.
2. Verify the qualifications of all of the Special Inspectors.
3. Verify the qualifications of fabricators.
4. Maintain a 3-ring binder for the Special Inspector's daily and biweekly reports. This file must be located in a conspicuous place in the project trailer/office to allow review by the Owner and the SER.

5. Maintain a rework items list that includes discrepancies noted on the Special Inspector's daily report.

C. Special Inspectors:

1. Inspect all elements of the project for which the special inspector is qualified to inspect and are identified in the Schedule of Special Inspections.
2. Submit Special Inspections agency's written NDT practices for the monitoring and control of the agency's operations to include the following:
  - a. The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel.
  - b. The agency's inspection procedures, including general inspection, material controls, and visual welding inspection.
3. Report discrepancies that are observed during Special Inspections to the contractor for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report.
4. Submit a biweekly Special Inspection Report until all inspections are complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:
  - a. A brief summary of the work performed during the reporting time frame.
  - b. Changes and discrepancies with the drawings, specifications and mechanical or electrical component certification that were observed during the reporting period.
  - c. Discrepancies which were resolved or corrected.
  - d. A list of nonconforming items requiring resolution.
  - e. All applicable test results, including nondestructive testing reports.
5. Submit final Special Inspection Report to the owner at completion of project.

END

## SCHEDULE OF SPECIAL INSPECTIONS

Reference UFGS 01 45 35 for all requirements not noted as part of this schedule.

### INSPECTION DEFINITIONS:

- PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and noted verification.
- OBSERVE:** Observe these items randomly during the course of each work day to insure that applicable requirements are being met. Operations need not be delayed pending these inspections at contractor's risk.
- DOCUMENT:** Document, with a report, that the work has been performed in accordance with the contract documents. This is in addition to any other reports required in the Special Inspections guide specification.
- CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

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The Seismic Design Category for this project is: ☐ A, ☒ B, ☐ C, ☐ D, ☐ E, ☐ F (check appropriate box)

**STRUCTURAL - STEEL – WELDING SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| STEEL INSPECTION <u>PRIOR TO WELDING</u> – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.4-1 |                              |  |
|---|------------------------------|--|
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION  |
| 1. Verify that the welding procedures specification (WPS) is available  | <b>PERFORM</b>               |  |
| 2. Verify manufacturer certifications for welding consumables are available   | <b>PERFORM</b>               |  |
| 3. Verify material identification   | <b>PERFORM</b>               | Type and grade.  |
| 4. Welder Identification System   | <b>PERFORM</b>               | The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type.   |
| 5. Fit-up of groove welds (including joint geometry)  | OBSERVE                      | <ul style="list-style-type: none"> <li>✓ Joint preparation</li> <li>✓ Dimensions (alignment, root opening, root face, bevel)</li> <li>✓ Cleanliness (condition of steel surfaces)</li> <li>✓ Tacking (tack weld quality and location)</li> <li>✓ Backing type and fit (if applicable)</li> </ul>   |
| 6. Configuration and finish of access holes   | OBSERVE                      |  |
| 7. Fit-up of fillet welds   | OBSERVE                      | <ul style="list-style-type: none"> <li>✓ Dimensions (alignment, gaps at root)</li> <li>✓ Cleanliness (condition of steel surfaces)</li> <li>✓ Tacking (tack weld quality and location)</li> </ul>  |
| STEEL INSPECTION <u>DURING WELDING</u> – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.4-2   |                              |  |
| TASK  | INSPECTION TYPE              | DESCRIPTION  |
| 8. Use of qualified welders   | <b>PERFORM</b>               | Welding by welders, welding operators, and tack welders who are qualified in conformance with requirements.  |
| 9. Control and handling of welding consumables  | OBSERVE                      | <ul style="list-style-type: none"> <li>✓ Packaging</li> <li>✓ Electrode atmospheric exposure control</li> </ul>  |
| 10. No welding over cracked tack welds  | OBSERVE                      |  |
| 11. Environmental conditions  | OBSERVE                      | <ul style="list-style-type: none"> <li>✓ Wind speed within limits</li> <li>✓ Precipitation and temperature</li> </ul>  |
| 12. Welding Procedures Specification followed   | OBSERVE                      | <ul style="list-style-type: none"> <li>✓ Settings on welding equipment</li> <li>✓ Travel speed</li> <li>✓ Selected welding materials</li> <li>✓ Shielding gas type/flow rate</li> <li>✓ Preheat applied</li> <li>✓ Interpass temperature maintained (min./max.)</li> <li>✓ Proper position (F, V, H, OH)</li> <li>✓ Intermix of filler metals avoided</li> </ul> |
| 13. Welding techniques  | OBSERVE                      | <ul style="list-style-type: none"> <li>✓ Interpass and final cleaning</li> <li>✓ Each pass within profile limitations</li> <li>✓ Each pass meets quality requirements</li> </ul>   |

<sup>1</sup> **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.

**OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

**STRUCTURAL - STEEL – WELDING SECTION (CONTINUED)**

| STEEL INSPECTION AFTER WELDING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.4-3 |                              |   |
|---|------------------------------|---|
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION   |
| 14. Welds cleaned   | OBSERVE                      |   |
| 15. Size, length, and location of all welds   | PERFORM                      | Size, length, and location of all welds conform to the requirements of the detail drawings.   |
| 16. Welds meet visual acceptance criteria   | PERFORM AND DOCUMENT         | <ul style="list-style-type: none"> <li>✓ Crack prohibition</li> <li>✓ Weld/base-metal fusion</li> <li>✓ Crater cross section</li> <li>✓ Weld profiles</li> <li>✓ Weld size</li> <li>✓ Undercut</li> <li>✓ Porosity</li> </ul> |
| 17. Arc strikes   | PERFORM                      |   |
| 18. k-area  | PERFORM                      | When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks.   |
| 19. Backing removed, weld tabs removed and finished, and fillet welds added where required                                | PERFORM                      |   |
| 20. Repair activities   | PERFORM AND DOCUMENT         |   |
| 21. Document acceptance or rejection of welded joint or member  | PERFORM                      |   |

**END SECTION**

<sup>1</sup> **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.  
**DOCUMENT:** Document in a report that the work has been performed as required. This is in addition to all other required reports.

**STRUCTURAL - STEEL – BOLTING SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| STEEL INSPECTION TASKS PRIOR TO BOLTING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.6-1           |                              |             |
|--|------------------------------|-------------|
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 1. Manufacturer's certifications available for fastener materials  | <b>PERFORM</b>               |             |
| 2. Fasteners marked in accordance with ASTM requirements   | OBSERVE                      |             |
| 3. Proper fasteners selected for joint detail (grade, type, bolt length if threads are to be excluded from shear plane)                      | OBSERVE                      |             |
| 4. Proper bolting procedure selected for joint detail  | OBSERVE                      |             |
| 5. Connecting elements, including appropriate faying surface condition and hole preparation, if specified, meet applicable requirements      | OBSERVE                      |             |
| 6. Proper storage provided for bolts, nuts, washers, and other fastener components   | OBSERVE                      |             |
| STEEL INSPECTION TASKS DURING BOLTING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.6-2             |                              |             |
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 7. Fastener assemblies of suitable condition, placed in all holes and washers (if required) are positioned as required                       | OBSERVE                      |             |
| 8. Joint brought to the snug-tight condition prior to pretensioning operation  | OBSERVE                      |             |
| 9. Fastener component not turned by the wrench prevented from rotating   | OBSERVE                      |             |
| 10. Bolts are pretensioned in accordance with RCSC Specification, progressing systematically from the most rigid point toward the free edges | OBSERVE                      |             |
| STEEL INSPECTION TASKS AFTER BOLTING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 1705.2.1, AISC 360-10: Table C-N5.6-3                   |                              |             |
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 11. Document acceptance or rejection of all bolted connections   | <b>DOCUMENT</b>              |             |

**END SECTION**

<sup>1</sup> **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.  
**OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.  
**DOCUMENT:** Document in a report that the work has been performed as required. This is in addition to all other required reports.



**STRUCTURAL - STEEL - NON DESTRUCTIVE TESTING SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| NONDESTRUCTIVE TESTING OF WELDED JOINTS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Section N5.5 |                              |   |
|--|------------------------------|---|
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION   |
| 1. Use of qualified nondestructive testing personnel   | <b>PERFORM</b>               | Visual weld inspection and nondestructive testing (NDT) shall be conducted by personnel qualified in accordance with AWS D1.8 clause 7.2  |
| 2. CJP groove welds  | OBSERVE                      | Dye penetrant testing (DT) and ultrasonic testing (UT) shall be performed on 20% of CJP groove welds for materials greater than 5/16" (8mm) thick. Testing rate must be increased to 100% if greater than 5% of welds tested have unacceptable defects. |
| 3. Welded joints subject to fatigue  | OBSERVE                      | Dye penetrant testing (DT) and Ultrasonic testing (UT) shall be performed on 100% of welded joints identified on contract drawings as being subject to fatigue.   |
| 4. Weld tab removal sites  | OBSERVE                      | At the end of welds where weld tabs have been removed, magnetic particle testing shall be performed on the same beam-to-column joints receiving UT  |

**END SECTION**

<sup>1</sup> **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.

**OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

**STRUCTURAL - STEEL - OTHER INSPECTIONS****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| OTHER STEEL INSPECTIONS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 341-16: Tables J8.1 & J10.1 |                              |  |
|---|------------------------------|--|
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION  |
| 1. Anchor rods and other embedments supporting structural steel   | <b>PERFORM</b>               | Verify the diameter, grade, type, and length of the anchor rod or embedded item, and the extent or depth of embedment prior to placement of concrete.                            |
| 2. Fabricated steel or erected steel frame  | <b>OBSERVE</b>               | Verify compliance with the details shown on the construction documents, such as braces, stiffeners, member locations and proper application of joint details at each connection. |
| 3. Reduced beam sections (RBS) where/if occurs  | <b>DOCUMENT</b>              | ✓ Contour and finish<br>✓ Dimensional tolerances   |
| 4. Protected zones  | <b>DOCUMENT</b>              | No holes or unapproved attachments made by fabricator or erector   |
| 5. H-piles where/if occurs  | <b>DOCUMENT</b>              | No holes or unapproved attachments made by the responsible contractor  |

**END SECTION**


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<sup>1</sup> **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.  
**OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.  
**DOCUMENT:** Document in a report that the work has been performed as required. This is in addition to all other required reports.

**STRUCTURAL - COLD-FORMED METAL DECK - PLACEMENT SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| METAL DECK INSPECTION PRIOR TO DECK PLACEMENT – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>SDI QA/QC-2011, Appendix 1, Table 1.1                                  |                              |             |
|--|------------------------------|-------------|
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 1. Verify compliance of materials (deck and all deck accessories) with construction documents, including profiles, material properties, and base metal thickness | <b>PERFORM</b>               |             |
| 2. Document acceptance or rejection of deck and deck accessories   | <b>DOCUMENT</b>              |             |
| METAL DECK INSPECTION DURING DECK PLACEMENT – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>SDI QA/QC-2011, Appendix 1, Table 1.2                                    |                              |             |
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 3. Verify compliance of deck and all deck accessories installation with construction documents   | <b>PERFORM</b>               |             |
| 4. Verify deck materials are represented by the mill certifications that comply with the construction documents  | <b>PERFORM</b>               |             |
| 5. Document acceptance or rejection of installation of deck and deck accessories   | <b>DOCUMENT</b>              |             |
| METAL DECK INSPECTION AFTER DECK PLACEMENT – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>SDI QA/QC-2011, Appendix 1, Table 1.3                                     |                              |             |
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 6. Welding procedure specification (WPS) available   | <b>PERFORM</b>               |             |
| 7. Manufacturers certifications for welding consumables available  | <b>OBSERVE</b>               |             |
| 8. Material identification (type/grade)  | <b>OBSERVE</b>               |             |
| 9. Check welding equipment   | <b>OBSERVE</b>               |             |

**END SECTION**

<sup>1</sup> **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.  
**OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.  
**DOCUMENT:** Document in a report that the work has been performed as required. This is in addition to all other required reports.

**STRUCTURAL - COLD-FORMED METAL DECK – WELDING SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| METAL DECK INSPECTION <u>DURING</u> WELDING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>SDI QA/QC-2011, Appendix 1, Table 1.4 |                              |             |
|---|------------------------------|-------------|
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 1. Use of qualified welders   | OBSERVE                      |             |
| 2. Control and handling of welding consumables  | OBSERVE                      |             |
| 3. Environmental conditions (wind speed, moisture, temperature)   | OBSERVE                      |             |
| 4. WPS followed   | OBSERVE                      |             |
| METAL DECK INSPECTION <u>AFTER</u> WELDING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>SDI QA/QC-2011, Appendix 1, Table 1.5  |                              |             |
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 5. Verify size and location of welds, including support, sidelap, and perimeter welds.  | <b>PERFORM</b>               |             |
| 6. Welds meet visual acceptance criteria  | <b>PERFORM</b>               |             |
| 7. Verify repair activities   | <b>PERFORM</b>               |             |
| 8. Document acceptance or rejection of welds  | <b>DOCUMENT</b>              |             |

**END SECTION**

<sup>1</sup> **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.  
**OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.  
**DOCUMENT:** Document in a report that the work has been performed as required. This is in addition to all other required reports.

**STRUCTURAL - OPEN-WEB STEEL JOISTS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| OPEN-WEB STEEL JOISTS AND JOIST GIRDERS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC TABLE 1705.2.3 |                              |  |
|--|------------------------------|--|
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION  |
| 1. Installation of open-web steel joists and joist girders   | OBSERVE                      | <ul style="list-style-type: none"> <li>✓ End connections – welded or bolted</li> <li>✓ Bridging – horizontal and diagonal</li> </ul> |

**END SECTION****STRUCTURAL - CONCRETE CONSTRUCTION SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| CONCRETE CONSTRUCTION, INCLUDING COMPOSITE DECK – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC TABLE 1705.3 (ACI 318 REFERENCES NOTED IN IBC TABLE)       |                                |  |
|--|--------------------------------|--|
| TASK   | INSPECTION TYPE <sup>1</sup>   | DESCRIPTION  |
| 1. Inspect reinforcement, including prestressing tendons, and verify placement.  | OBSERVE                        | Verify prior to placing concrete that reinforcing is of specified type, grade and size; that it is free of oil, dirt and unacceptable rust; that it is located and spaced properly; that hooks, bends, ties, stirrups and supplemental reinforcement are placed correctly; that lap lengths, stagger and offsets are provided; and that all mechanical connections are installed per the manufacturer's instructions and/or evaluation report. |
| 2. Cast in place anchors and post installed drilled anchors (downward inclined)  | OBSERVE                        | Verify prior to placing concrete that cast in place anchors and post installed drilled anchors have proper embedment, spacing and edge distance.   |
| 3. Post-installed adhesive anchors in horizontal or upward inclined orientations   | <b>CONTINUOUS AND DOCUMENT</b> | <ul style="list-style-type: none"> <li>✓ Inspect as required per approved ICC-ES report</li> <li>✓ Verify that installer is certified for installation of horizontal and overhead installation applications</li> <li>✓ Inspect proof loading as required by the contract documents</li> </ul>  |
| 4. Verify use of required mix design   | OBSERVE                        | Verify that all mixes used comply with the approved construction documents   |
| 5. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete | <b>CONTINUOUS</b>              | At the time fresh concrete is sampled to fabricate specimens for strength test verify these tests are performed by qualified technicians.  |
| 6. Inspect concrete and/or shotcrete placement for proper application techniques   | <b>CONTINUOUS</b>              | Verify proper application techniques are used during concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.  |
| 7. Verify maintenance of specified curing temperature and technique  | OBSERVE                        | Inspect curing, cold weather protection, and hot weather protection procedures.  |

**CONTINUED ON FOLLOWING PAGE**

<sup>1</sup> **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

**DOCUMENT:** Document in a report that the work has been performed as required. This is in addition to all other required reports.

**CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

**STRUCTURAL - CONCRETE CONSTRUCTION (CONTINUED)**

| CONCRETE CONSTRUCTION, INCLUDING COMPOSITE DECK – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC TABLE 1705.3 (ACI 318 REFERENCES NOTED IN IBC TABLE)                    |                              |             |
|---|------------------------------|-------------|
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 8. 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. | OBSERVE                      |             |
| 9. Inspect formwork for shape, location and dimensions of the concrete member being formed.   | OBSERVE                      |             |

**END SECTION**


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<sup>1</sup> **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

**DOCUMENT:** Document in a report that the work has been performed as required. This is in addition to all other required reports.

**CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

**GEOTECHNICAL - SOILS INSPECTION SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| SOILS INSPECTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 1705.6   |                              |   |
|---|------------------------------|---|
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION   |
| 1. Materials below shallow foundations are adequate to achieve the design bearing capacity.                         | OBSERVE                      |   |
| 2. Excavations are extended to proper depth and have reached proper material  | OBSERVE                      |   |
| 3. Perform classification and testing of compacted fill materials   | <b>OBSERVE</b>               |   |
| 4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill | <b>CONTINUOUS</b>            |   |
| 5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.          | OBSERVE                      | During fill placement, the special inspector shall verify that proper materials and procedures are used in accordance with the provisions of the approved geotechnical report |

**END SECTION****GEOTECHNICAL - DRIVEN DEEP FOUNDATION ELEMENTS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| DEEP DRIVEN FOUNDATION CONSTRUCTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 1705.7   |                              |             |
|--|------------------------------|-------------|
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 1. Verify element materials, sizes and lengths comply with requirements  | <b>CONTINUOUS</b>            |             |
| 2. Inspect driving operations and maintain complete and accurate records for each element  | <b>CONTINUOUS</b>            |             |
| 3. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element | <b>CONTINUOUS</b>            |             |
| 4. Determine capacities of test elements and conduct additional load tests if required.  | <b>CONTINUOUS</b>            |             |
| 5. For steel or concrete elements, perform additional special inspections in accordance with the Steel and Concrete sections in this schedule  |                              |             |

**END SECTION**

<sup>1</sup> **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

**CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

**GEOTECHNICAL - HELICAL PILE FOUNDATIONS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| HELICAL PILE FOUNDATIONS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.9  |                              |             |
|---|------------------------------|-------------|
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION |
| 1. Record installation equipment used, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required. The approved geotechnical report and the contract documents shall be used to determine compliance | <b>CONTINUOUS</b>            |             |

**END SECTION****GEOTECHNICAL - CAST IN PLACE DEEP FOUNDATION ELEMENTS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| CAST IN PLACE DEEP FOUNDATION ELEMENTS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.8   |                              |  |
|--|------------------------------|--|
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION  |
| 1. Inspect drilling operations and maintain complete and accurate records for each element.  | <b>CONTINUOUS</b>            |  |
| 2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes | <b>CONTINUOUS</b>            | For concrete elements, perform additional special inspections in accordance with the Concrete section in this schedule |

**END SECTION**

<sup>1</sup> **CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.



**FIRE PROTECTION - SPRAYED FIRE-RESISTANT MATERIALS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| SPRAYED FIRE RESISTANT MATERIALS (SFRM) – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.14 |                              |  |
|--|------------------------------|--|
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION  |
| 1. Substrate condition   | OBSERVE                      | Prior to application, confirm that surfaces have been prepared according to the approved fire-resistance design and manufacturer's instructions. |
| 2. Material thickness  | OBSERVE                      | Verify SFRM thickness according to 2018 IBC 1705.14.4  |
| 3. Material density  | OBSERVE                      | Verify SFRM density according to 2018 IBC 1705.14.5  |
| 4. Bond strength   | OBSERVE                      | Verify bond strength of cured SFRM according to IBC 1705.14.6  |

**END SECTION****FIRE PROTECTION - MASTIC AND INTUMESCENT COATINGS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.15 |                              |  |
|---|------------------------------|--|
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION  |
| 1. Inspect according to AWCI 12-B and the contract documents  | OBSERVE                      | Inspections shall be performed in accordance with AWCI 12-B, Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials. |

**END SECTION****FIRE PROTECTION – FIRE RESISTANT PENETRATIONS AND JOINTS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| FIRE RESISTANT PENETRATIONS AND JOINTS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.17 |                              |  |
|---|------------------------------|--|
| TASK  | INSPECTION TYPE <sup>1</sup> | DESCRIPTION  |
| 1. Inspections of penetration firestop systems conducted in accordance with ASTM E 2174.            | OBSERVE                      | [NOTE: This section applies to Risk Category III, IV, & V only. DOR may choose to uncheck this section where project is assigned to Risk Category I or II. Confirm Risk Category with Structural Engineer] |
| 2. Inspections of fire-resistant joint systems conducted in accordance with ASTM E 2393             | OBSERVE                      |  |

**END SECTION**

<sup>1</sup> **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

**ARCHITECTURAL - EXTERIOR INSULATION AND FINISH SYSTEMS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.16 |                              |   |
|--|------------------------------|---|
| TASK   | INSPECTION TYPE <sup>1</sup> | DESCRIPTION   |
| 1. Water resistive barrier coating applied over a sheathing substrate.                                     | OBSERVE                      | Verify that water resistive barrier coating complies with ASTM E 2570.<br><b>[NOTE: not applicable to masonry or concrete wall applications. Uncheck this section in those cases]</b> |

**END SECTION**

<sup>1</sup> **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

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 requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.
- E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

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- B. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- C. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- D. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- E. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- F. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
  - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
  - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
  - 3. Indicate methods to be used to avoid trapping water in finished work.
- G. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
  - 1. Locations of dust-control partitions at each phase of work.
  - 2. HVAC system isolation schematic drawing.
  - 3. Location of proposed air-filtration system discharge.
  - 4. Waste-handling procedures.
  - 5. Other dust-control measures.
- H. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by Owner. Include the following:
  - 1. Methods used to meet the goals and requirements of Owner.
  - 2. Concrete cutting method(s) to be used.
  - 3. Location of construction devices on the site.
  - 4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
  - 5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with Owner.
  - 6. Indicate locations of sensitive areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

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1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices:
  - 1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

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PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
  - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
    - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
    - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
  - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
  - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service:

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1. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
  1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
- D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
  1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- E. Electric Power Service:
  1. Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- G. Project Computer: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:

### 3.4 SUPPORT FACILITIES INSTALLATION

- A. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
  2. Maintain access for fire-fighting equipment and access to fire hydrants.
- B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- C. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  1. Dispose of rainwater in a lawful manner that will not result in flooding Project or

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- adjoining properties or endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
  - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  - 3. Maintain and touch up signs, so they are legible at all times.
- F. Waste Disposal Facilities:
  - 1. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
  - 2. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- H. Temporary Elevator Use: .
- I. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
  - 1. Do not load elevators beyond their rated weight capacity.
  - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- J. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
  - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

### 3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and



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other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control:
1. Comply with requirements specified in Section 311000 "Site Clearing."
  2. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, in accordance with erosion- and sedimentation-control Drawings.
    - a. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
    - b. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
    - c. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
    - d. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection:
1. Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
  2. Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

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2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
  2. Paint and maintain appearance of walkway for duration of the Work.
- L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- M. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
  2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
  3. Insulate partitions to control noise transmission to occupied areas.
  4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
  5. Protect air-handling equipment.
  6. Provide walk-off mats at each entrance through temporary partition.
- N. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
  2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.

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3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
  1. Protect porous materials from water damage.
  2. Protect stored and installed material from flowing or standing water.
  3. Keep porous and organic materials from coming into prolonged contact with concrete.
  4. Remove standing water from decks.
  5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
  1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  2. Keep interior spaces reasonably clean and protected from water damage.
  3. Periodically collect and remove waste containing cellulose or other organic matter.
  4. Discard or replace water-damaged material.
  5. Do not install material that is wet.
  6. Discard and replace stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
  1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

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- c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION

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SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of this Section Includes: General protection of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
  - 1. Section 015000 "Temporary Facilities and Controls" for temporary controls, utilities, support facilities and temporary site fencing.
  - 2. Section 311000 "Site Clearing" for removing existing trees and shrubs.

1.2 DEFINITIONS

- A. Caliper: Diameter of a trunk measured at a height 6 inches above the ground for trees up to and including 4-inch size at this height and as measured at a height of 12 inches above the ground for trees larger than 4-inch size.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by a circle concentric with each tree with a radius equal to the diameter of the drip line unless otherwise indicated.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
  - 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 plants designated to remain.

1.4 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:

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1. Storage of construction materials, debris, or excavated material.
  2. Moving or 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.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.
- D. Take precautions to protect plants from airborne contaminants, such as paint or fireproofing overspray.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Backfill Soil: Satisfactory soils as defined in Section 312000 "Earthwork".
- B. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.
    - a. Height: 48 inches.
    - b. Color: High-visibility orange, nonfading.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

### 3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches above the ground.

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- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

### 3.3 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
  - 1. Plastic Fencing: Stretch fabric taut and secure to posts without bows or sags.
- B. Maintain protection zones free of weeds and trash.
- C. Maintain hydration of plants to assure plant survival.
- D. Maintain protection-zone fencing in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

### 3.4 EXCAVATION

- A. Excavation within Protection Zones: Where excavation is required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with the Work. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

### 3.5 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
  - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
  - 2. Cut Ends: Do not paint cut root ends.
  - 3. Temporarily support and protect roots from damage until they are permanently covered with soil.
  - 4. Cover exposed roots with burlap and water regularly.
  - 5. Backfill as soon as possible in accordance with requirements in Section 312000 "Earth Moving."
- B. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

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3.6 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

END OF SECTION



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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The Work of This Section Includes: Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  1. Section 012100 "Allowances" for products selected under an allowance.
  2. Section 012300 "Alternates" for products selected under an alternate.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
  3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
  1. Evaluating Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements

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for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
  - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
  - 2. Data indicating compliance with the requirements specified in "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
  - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is inconspicuous.
  - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
    - a. Name of product and manufacturer.
    - b. Model and serial number.
    - c. Capacity.
    - d. Speed.
    - e. Ratings.
  - 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

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1.5 COORDINATION

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  - 4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
  - 1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
  - 2. Store products to allow for inspection and measurement of quantity or counting of units.
  - 3. Store materials in a manner that will not endanger Project structure.
  - 4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
  - 5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  - 7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections are to be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of Owner or endorsed by manufacturer to Owner.

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2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.
  6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
    - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by Architect, whose determination is final.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
    - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

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2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
  - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
  - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
  - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
  - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

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- a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
  - 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
  - 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
  - 3. Evidence that proposed product provides specified warranty.
  - 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
  - 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
  - 1. Architect's Approval of Submittal: Marked with approval notation from Architect's action stamp. See Section 013300 "Submittal Procedures."
  - 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

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- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Progress cleaning.
  - 6. Protection of installed construction.
  - 7. Correction of the Work.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for limits on use of Project site.
  - 2. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
  - 1. Include description of provisions for temporary services and systems during interruption of permanent services and systems.



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#### 1.4 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
  - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    - a. Water, moisture, or vapor barriers.
    - b. Membranes and flashings.
    - c. Exterior curtain-wall construction.
    - d. Sprayed fire-resistive material.
    - e. Equipment supports.
    - f. Piping, ductwork, vessels, and equipment.
  - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
  - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

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1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

### 3.4 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

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1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  2. Allow for building movement, including thermal expansion and contraction.
  3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

### 3.5 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

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3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.6 PROGRESS CLEANING

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

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1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.7 PROTECTION OF INSTALLED CONSTRUCTION

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

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

3.8 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.



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1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

END OF SECTION

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SECTION 017700 - CLOSEOUT PROCEDURES

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 administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final Completion procedures.
  - 3. List of incomplete items.
  - 4. Submittal of Project warranties.
  - 5. Final cleaning.
  - 6. Repair of the Work.
- B. Related Requirements:
  - 1. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
  - 2. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
  - 3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 4. Section 017900 "Demonstration and Training" for requirements to train Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of cleaning agent.
- C. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

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- D. Certified List of Incomplete Items: Final submittal at Final Completion.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Certificates of Release: From authorities having jurisdiction.
- C. Certificate of Insurance: For continuing coverage.
- D. Field Report: For pest-control inspection.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

#### 1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
  - 5. Submit testing, adjusting, and balancing records.
  - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

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1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
  6. Advise Owner of changeover in utility services.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements.
  10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for Final Completion.

## 1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list will state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report.
  5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

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

#### 1.9 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
  2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Page number.
  4. Submit list of incomplete items in the following format:
    - a. MS Excel Electronic File: Architect will return annotated file.
    - b. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

#### 1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  1. Submit on digital media acceptable to Architect.
- E. Warranties in Paper Form:

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

## PART 2 - PRODUCTS

### 2.1 MATERIALS

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

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

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- h. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
- i. Vacuum and mop concrete.
- j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean in accordance with manufacturer's instructions if visible soil or stains remain.
- k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
- l. Remove labels that are not permanent.
- m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
  - 1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.
- q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
- r. Clean strainers.
- s. Leave Project clean and ready for occupancy.

- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 "Construction Waste Management and Disposal."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
  - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
  - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

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3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION



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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Emergency manuals.
  - 3. Systems and equipment operation manuals.
  - 4. Systems and equipment maintenance manuals.
  - 5. Product maintenance manuals.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.

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2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- C. Format: Submit operation and maintenance manuals in the following format:
1. Submit on digital media acceptable to Architect or by uploading to web-based project software site. Enable reviewer comments on draft submittals.
  2. Submit three paper copies. Architect will return two copies.
- D. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- E. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

## 1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of

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contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

#### 1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual to contain the following materials, in the order listed:
  1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
  1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.
  7. Name and contact information for Architect.
  8. Name and contact information for Commissioning Authority.
  9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

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- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation in accordance with ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

#### 1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
  - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
  - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
  - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

#### 1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
  - 1. Type of emergency.
  - 2. Emergency instructions.
  - 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  - 1. Fire.
  - 2. Flood.
  - 3. Gas leak.
  - 4. Water leak.
  - 5. Power failure.
  - 6. Water outage.
  - 7. System, subsystem, or equipment failure.
  - 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

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E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.

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3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

#### 1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.

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3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of maintenance manuals.
- 1.11 PRODUCT MAINTENANCE MANUALS
- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and

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telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION



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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for final property survey.
  - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
  - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set of marked-up record prints.
  - 2. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit one paper-copy set of marked-up record prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
      - 2) Print each drawing, whether or not changes and additional information were recorded.

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- C. Record Specifications: Submit annotated PDF electronic files and one paper copy of Project's Specifications, including addenda and Contract modifications.
- D. Record Product Data: Submit annotated PDF electronic files and directories and one paper copy of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories and one paper copy of each submittal.

#### 1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding photographic documentation.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  - 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

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5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
  2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Architect for resolution.
  4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
    - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file with comment function enabled.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

## 1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  3. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

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1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
  - 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
  - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Demolition and removal of selected portions of exterior or interior of building or structure and site elements.
2. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 017300 "Execution" for cutting and patching procedures.
4. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
5. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage; prepare for reuse; and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

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1.4 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 5. Review areas where existing construction is to remain and requires protection.
  - 6. Review and finalize protection requirements.
  - 7. Review procedures for noise control and dust control.
  - 8. Review storage, protection, and accounting for items to be removed for salvage or reinstallation.

1.6 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Statements: For refrigerant recovery technician.
- C. Engineering Survey: Submit engineering survey of condition of building.
- D. Survey of Existing Conditions: Submit survey.
- E. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property for dust control and for noise control. Indicate proposed locations and construction of barriers.
- F. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Temporary interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.
  - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed in accordance with EPA regulations. Include name and address of technician and date refrigerant was recovered.

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- H. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Inventory: Submit a list of items that have been removed and salvaged.

#### 1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

#### 1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
  - 1. Before selective demolition, Owner will remove the following items:
    - a. Furniture and movable equipment.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials:
  - 1. It is not expected that hazardous materials will be encountered in the Work.
    - a. Hazardous materials will be removed by Owner before start of the Work.
    - b. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. On-site sale of removed items or materials is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire protection facilities service during selective demolition operations.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video. Comply with Section 013233 "Photographic Documentation."
  - 1. Inventory and record the condition of items to be removed for salvage or reinstallation. Photograph or video conditions that might be misconstrued as damage caused by removal.
  - 2. Photograph or video existing conditions of adjoining construction including finish surfaces, that might be misconstrued as damage caused by selective demolition operations or removal of items for salvage or reinstallation.

3.2 PREPARATION

- A. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of selective demolition.
- B. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.



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3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- D. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment in accordance with 40 CFR 82 and regulations of authorities having jurisdiction.

### 3.3 UTILITY SERVICES AND BUILDING SYSTEMS

- A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utilities and building systems serving areas to be selectively demolished.
1. Owner will arrange to shut off indicated utilities when requested by Contractor.
  2. Arrange to shut off utilities with utility companies.
  3. If disconnection of utilities and building systems will affect adjacent occupied parts of the building, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to those parts of the building.
  4. Demolish and remove existing building systems, equipment, and components indicated on Drawings to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    - c. Equipment to Be Removed: Disconnect and cap services and remove equipment and components.
  5. Abandon existing building systems, equipment, and components indicated on Drawings to be abandoned in place.
    - a. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    - b. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.
  6. Remove and reinstall/salvage existing building systems, equipment, and components indicated on drawings to be removed and reinstalled or removed and salvaged:

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- a. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment and components; when appropriate, reinstall, reconnect, and make equipment operational.
- b. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and components and deliver to Owner.

### 3.4 SALVAGE/REINSTALL

#### A. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

#### B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

### 3.5 SELECTIVE DEMOLITION, GENERAL

#### A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 4 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

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9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
  2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

### 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete:
1. Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
  2. Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive in accordance with recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
1. Do not allow demolished materials to accumulate on-site.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

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3.8 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

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SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.
3. Mechanical splice couplers.

C. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Qualification Statements: For testing and inspection agency.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:
  - a. Mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
2. Mechanical splice couplers.

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3. Retain "Field quality-control reports" Paragraph below if Contractor is responsible for field quality-control testing and inspecting.
4. Field quality-control reports.

D. Minutes of preinstallation conference.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
  1. Store reinforcement to avoid contact with earth.

### PART 2 - PRODUCTS

#### 2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Galvanized Reinforcing Bars:
  1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
  2. Zinc Coating: ASTM A767/A767M, Class I, zinc-coated after fabrication and bending.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
- E. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.
- F. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, plain steel.

#### 2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

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1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
  - b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
  - c. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
- C. Mechanical Splice Couplers: ACI 318 Type 1, same material of reinforcing bar being spliced; tension-compression type.
- D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
  1. Finish: Plain.

## 2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection of In-Place Conditions:
  1. Do not cut or puncture vapor retarder.
  2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

### 3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
  1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
  2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

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- F. Splices: Lap splices as indicated on Drawings.
  - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
  - 2. Stagger splices in accordance with ACI 318.
  - 3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
- G. Install welded-wire reinforcement in longest practicable lengths.
  - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
    - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
  - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
  - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
  - 4. Lace overlaps with wire.
- H. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.
- I. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material in accordance with ASTM A780/A780M.

### 3.3 JOINTS

- A. 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.
  - 2. Continue reinforcement across construction joints unless otherwise indicated.
  - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

### 3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.



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C. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement mechanical splice couplers.

END OF SECTION

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete standards.
2. Concrete materials.
3. Admixtures.
4. Fiber reinforcement.
5. Vapor retarders.
6. Floor and slab treatments.
7. Liquid floor treatments.
8. Curing materials.
9. Accessories.
10. Repair materials.
11. Concrete mixture materials.
12. Concrete mixture class types.
13. Concrete mixing.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
2. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement or blended hydraulic cement alone or in combination with one or more of the following:

1. Fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cementitious Materials (w/cm) Ratio: The ratio by weight of mixing water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
  - a. Contractor's superintendent.

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- b. Independent testing agency responsible for inspections and acceptance testing of concrete at Project site.
  - c. Ready-mix concrete manufacturer.
  - d. Concrete Subcontractor.
  - e. Special concrete finish Subcontractor.
- 2. Review the following:
  - a. Special inspection and testing and inspecting agency procedures for field quality control.
  - b. Construction joints, control joints, isolation joints, and joint-filler strips.
  - c. Vapor-retarder installation.
  - d. Anchor rod and anchorage device installation tolerances.
  - e. Cold- and hot-weather concreting procedures.
  - f. Concrete finishes and finishing.
  - g. Curing procedures.
  - h. Forms and form-removal limitations.
  - i. Methods for achieving specified floor and slab flatness and levelness.
  - j. Floor and slab flatness and levelness measurements.
  - k. Concrete repair procedures.
  - l. Concrete protection.
  - m. Initial curing of standard-cured and field curing of field-cured test cylinders (ASTM C31/C31M.)
  - n. Protection of field cured field test cylinders.
  - o. Distribution of test reports.

#### 1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
  - 1. Portland cement.
  - 2. Blended hydraulic cement.
  - 3. Performance-based hydraulic cement.
  - 4. Fly ash.
  - 5. Slag cement.
  - 6. Silica fume.
  - 7. Natural or other pozzolans.
  - 8. Aggregates.
  - 9. Ground calcium carbonate and aggregate mineral fillers.
  - 10. Admixtures:
    - a. Include limitations of use. Admixtures that do not comply with reference ASTM International requirements must be submitted with test data for approval.
  - 11. Vapor retarders.
  - 12. Floor and slab treatments.
  - 13. Liquid floor treatments.
  - 14. Curing materials.
  - 15. Joint fillers.

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16. Repair materials.

C. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Compressive strength at 28 days or other age as specified.
3. Compressive strength required at stages of construction.
4. Durability exposure classes for Exposure Categories F, S, W, and C.
5. Maximum w/cm ratio.
6. Calculated equilibrium and fresh density for lightweight concrete.
7. Slump or slump flow limit.
8. Air content.
9. Nominal maximum aggregate size.
10. Steel-fiber reinforcement content.
11. Synthetic microfiber content.
12. Synthetic macrofiber content.
13. Intended placement method.
14. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.

D. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
  - a. Location of construction joints is subject to approval of the Architect.

E. Concrete Schedule: For each location of each class of concrete indicated in "Concrete Mixture Class Types" Article, including the following:

1. Concrete class designation.
2. Location within Project.
3. Exposure class designation.
4. Formed surface finish designation and final finish.
5. Final finish for floors.
6. Floor treatment, if any.

## 1.5 INFORMATIONAL SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Testing Agency: Include documentation indicating compliance with ASTM E329 or ASTM C1077 and copies of applicable ACI certificates for testing technicians or ACI Concrete Construction Special Inspector - MH, ASCC.

C. Material Certificates: For each of the following:

1. Cementitious materials.

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2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Joint-filler strips.
9. Repair materials.

D. Material Test Reports: For the following:

1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Natural or other pozzolans.
7. Aggregates.
8. Ground calcium carbonate and aggregate mineral filler.
9. Admixtures.

E. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances in accordance with ACI 117 and in compliance with ASTM E1155.

F. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC's Acceptance Criteria AC380.

G. Preconstruction Test Reports: For each mix design.

H. Field quality-control reports.

I. Minutes of preinstallation conference.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer's production facilities and delivery vehicles certified in accordance with NRMCA's certification requirements or equivalent approval by a State DOT.

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- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing that performs duties on behalf of the Architect/Engineer.
  - 1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Level 1. Testing agency laboratory supervisor tests to be an ACI-certified Concrete Laboratory Testing Technician, Level 2.
- D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
  - 1. Personnel conducting field tests on plastic concrete properties are to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with policies from ACI CPP 610.1 or an equivalent certification program.

#### 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
  - 1. Include the following information in each test report:
    - a. Admixture dosage rates.
    - b. Slump.
    - c. Air content.
    - d. Seven-day compressive strength.
    - e. 28-day compressive strength.
    - f. Evaluation of permeability-reducing admixtures.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

#### 1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 as follows:
  - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 2. When air temperature has fallen to, or is expected to fall below 40 deg F during the protection period, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 3. Do not use frozen materials or materials containing ice or snow.
  - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

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1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

#### 1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 CONCRETE STANDARDS

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

#### 2.2 CONCRETE MATERIALS

- A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type of admixture from single source from single manufacturer.

- B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type II,.
2. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag cement.
3. Performance-Based Hydraulic Cement: ASTM C1157/C1157M: Type GU, general use.
4. Pozzolans: ASTM C618, Class C, F, or N.
5. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

- C. Normal-Weight Aggregates:

1. Coarse Aggregate: ASTM C33/C33M, Class 3M
2. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
3. Fine Aggregate: ASTM C33/C33M.
4. Recycled Aggregate: Provide documentation of characteristics of recycled aggregate and mechanical properties and durability of proposed concrete, which incorporates recycled aggregate to conform to applicable requirements for the class of concrete.
5. Alkali-Silica Reaction: Comply with one of the following for each aggregate used:
  - a. Expansion Result of Aggregate: Not more than 0.04 percent at one year when tested in accordance with ASTM C1293.

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- b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567. Do not use this option with fly ash with an alkali content greater than 4.0 percent. Submit supporting data for each aggregate showing expansion in excess of 0.10 percent when tested in accordance with ASTM C1260.
  - c. Alkali Content in Concrete: Not to exceed 4 lb./cu. yd. for aggregate with expansion greater than or equal to 0.04 percent and less than 0.12 percent or 3 lb./cu. yd. for aggregate with expansion greater than or equal to 0.12 percent and less than 0.24 percent. Test aggregate reactivity in accordance with ASTM C1293. Calculate alkali content of concrete in accordance with ACI 301. Do not use this option with natural pozzolan or fly ash that has a calcium oxide content greater than 18 percent or an alkali content greater than 4.0 percent; or for an aggregate with expansion at one year greater than or equal to 0.24 percent when tested in accordance with ASTM C1293.
- D. Ground Calcium Carbonate or Aggregate Mineral Filler: ASTM C1797. Unless otherwise permitted, do not use mineral filler derived from carbonate sources in concrete for members assigned to Exposure Class S1, S2, or S3.

## 2.3 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.
- 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
  - 2. Retarding Admixture: ASTM C494/C494M, Type B.
  - 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
  - 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
  - 6. Admixtures with special properties, with documentation of claimed performance enhancement, ASTM C494/C494M, Type S.
  - 7. Set-Accelerating Corrosion-Inhibiting Admixture: ASTM C1582/C1582M.
- 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) Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
    - 2) GCP Applied Technologies Inc.
    - 3) MAPEI Corporation.
    - 4) Master Builders Solutions, brand of MBCC Group, a Sika company.
    - 5) Sika Corporation.
- C. Mixing Water for Concrete Mixtures and Water Used to Make Ice: ASTM C1602/C1602M. Include documentation of compliance with limits for alkalis, sulfates, chlorides, or solids content of mixing water from Table 2 in ASTM C1602/C1602M.



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## 2.4 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A. Include manufacturer's recommended thickness and adhesive or pressure-sensitive tape.
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. Barrier-Bac; Inteplast Group.
    - b. Foxfire Enterprises, Inc.
    - c. ISI Building Products.
    - d. Poly-America, L.P.
    - e. R&D Workshop.
    - f. Reef Industries, Inc.
    - g. Stego Industries, LLC.
    - h. Tex-Trude.
    - i. Viaflex.
    - j. W. R. Meadows, Inc.
- B. Sheet Vapor Retarder/Termite Barrier: ASTM E1745, Class A, except with maximum water-vapor permeance of 0.03 perms; complying with ICC Acceptance Criteria AC380. Include manufacturer's recommended adhesive or pressure-sensitive tape.
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. Polyguard Products, Inc.
  2. Low-Temperature Flexibility: Pass at minus 15 deg F; ASTM D146/D146M.
  3. Puncture Resistance: 224 lbf minimum; ASTM E154/E154M.
  4. Water Absorption: 0.1 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D570.
  5. Hydrostatic-Head Resistance: 231 ft. minimum; ASTM D5385/D5385M.

## 2.5 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Bone Dry Products, Inc.
    - b. ChemMasters, Inc.
    - c. ChemTec International.
    - d. Concrete Sealers USA.
    - e. Curecrete Distribution Inc.
    - f. Dayton Superior Corporation.

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- g. [Euclid Chemical Company \(The\); a subsidiary of RPM International, Inc.](#)
- h. HTS Chemical; Hi-Tech Systems.
- i. [Kaufman Products, Inc.](#)
- j. [Laticrete International, Inc.](#)
- k. MAPEI Corporation.
- l. Master Builders Solutions, brand of MBCC Group, a Sika company.
- m. [NewLook International, Inc.](#)
- n. [Nox-Crete Products Group.](#)
- o. [PROSOCO, Inc.](#)
- p. [Penetron USA, Inc.](#)
- q. SINAK.
- r. Solomon Colors Inc.
- s. [SpecChem, LLC.](#)
- t. [Specialty Products Group.](#)
- u. [US SPEC, Division of US MIX Company.](#)
- v. [V-Seal Concrete Sealers & Specialty Coatings.](#)
- w. [Vexcon Chemicals Inc.](#)
- x. [W. R. Meadows, Inc.](#)

## 2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh 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. [Bon Tool Co.](#)
    - b. [Brickform; a division of Solomon Colors.](#)
    - c. [ChemMasters, Inc.](#)
    - d. [Dayton Superior Corporation.](#)
    - e. [Euclid Chemical Company \(The\); a subsidiary of RPM International, Inc.](#)
    - f. [Kaufman Products, Inc.](#)
    - g. [Lambert Corporation.](#)
    - h. [Laticrete International, Inc.](#)
    - i. MAPEI Corporation.
    - j. Master Builders Solutions, brand of MBCC Group, a Sika company.
    - k. [Metalcrete Industries.](#)
    - l. [Nox-Crete Products Group.](#)
    - m. SINAK.
    - n. [Sika Corporation.](#)
    - o. [SpecChem, LLC.](#)
    - p. [TK Products Construction Coatings, a Fenix Group SPC Company.](#)
    - q. [Vexcon Chemicals Inc.](#)
    - r. [W. R. Meadows, Inc.](#)
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

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1. Color:
  - a. Ambient Temperature Below 50 deg F (10 deg C): Black.
  - b. Ambient Temperature between 50 and 85 deg F (10 and 29 deg C): Any color.
  - c. Ambient Temperature Above 85 deg F (29 deg C): White.
  
- D. Curing Paper: 8 ft. wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Henry, a Carlisle Company (formerly Henry Company and Carlisle Coatings & Waterproofing Inc. brands).
  
- E. Water: Potable water that does not cause staining of the surface.
  
- F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Anti-Hydro International, Inc.
    - b. ChemMasters, Inc.
    - c. Dayton Superior Corporation.
    - d. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
    - e. Kaufman Products, Inc.
    - f. Lambert Corporation.
    - g. Laticrete International, Inc.
    - h. MAPEI Corporation.
    - i. Nox-Crete Products Group.
    - j. SpecChem, LLC.
    - k. TK Products Construction Coatings, a Fenix Group SPC Company.
    - l. Vexcon Chemicals Inc.
    - m. W. R. Meadows, Inc.
  
- G. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Anti-Hydro International, Inc.
    - b. ChemMasters, Inc.
    - c. Dayton Superior Corporation.
    - d. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
    - e. Kaufman Products, Inc.
    - f. Lambert Corporation.
    - g. Laticrete International, Inc.

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- h. Master Builders Solutions, brand of MBCC Group, a Sika company.
  - i. [Metalcrete Industries.](#)
  - j. [Nox-Crete Products Group.](#)
  - k. PROSOCO, Inc.
  - l. [SpecChem, LLC.](#)
  - m. [TK Products Construction Coatings, a Fenix Group SPC Company.](#)
  - n. [Vexcon Chemicals Inc.](#)
  - o. [W. R. Meadows, Inc.](#)
- H. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating.
- 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. [ChemMasters, Inc.](#)
    - b. [Dayton Superior Corporation.](#)
    - c. [Euclid Chemical Company \(The\); a subsidiary of RPM International, Inc.](#)
    - d. [Kaufman Products, Inc.](#)
    - e. [Lambert Corporation.](#)
    - f. [Laticrete International, Inc.](#)
    - g. Master Builders Solutions, brand of MBCC Group, a Sika company.
    - h. [Metalcrete Industries.](#)
    - i. [Nox-Crete Products Group.](#)
    - j. [SpecChem, LLC.](#)
    - k. [V-Seal Concrete Sealers & Specialty Coatings.](#)
    - l. [Vexcon Chemicals Inc.](#)
    - m. [W. R. Meadows, Inc.](#)
- I. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class 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. [ChemMasters, Inc.](#)
    - b. [Concrete Sealers USA.](#)
    - c. [Dayton Superior Corporation.](#)
    - d. [Euclid Chemical Company \(The\); a subsidiary of RPM International, Inc.](#)
    - e. [Kaufman Products, Inc.](#)
    - f. [Lambert Corporation.](#)
    - g. [Laticrete International, Inc.](#)
    - h. MAPEI Corporation.
    - i. Master Builders Solutions, brand of MBCC Group, a Sika company.
    - j. [Metalcrete Industries.](#)
    - k. [Nox-Crete Products Group.](#)
    - l. PROSOCO, Inc.
    - m. [Right Pointe.](#)
    - n. [SpecChem, LLC.](#)
    - o. [TK Products Construction Coatings, a Fenix Group SPC Company.](#)
    - p. [Vexcon Chemicals Inc.](#)

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q. [W. R. Meadows, Inc.](#)

J. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class 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. [ChemMasters, Inc.](#)
- b. [Concrete Sealers USA.](#)
- c. [Dayton Superior Corporation.](#)
- d. [Euclid Chemical Company \(The\); a subsidiary of RPM International, Inc.](#)
- e. [Kaufman Products, Inc.](#)
- f. [Lambert Corporation.](#)
- g. [Laticrete International, Inc.](#)
- h. MAPEI Corporation.
- i. [Metalcrete Industries.](#)
- j. [Nox-Crete Products Group.](#)
- k. [Right Pointe.](#)
- l. SINAK.
- m. [SpecChem, LLC.](#)
- n. [TK Products Construction Coatings, a Fenix Group SPC Company.](#)
- o. [Vexcon Chemicals Inc.](#)
- p. [W. R. Meadows, Inc.](#)

## 2.7 ACCESSORIES

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Floor Slab Protective Covering: 8 ft. wide cellulose fabric.

1. [Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. [McTech Group, Inc.](#)

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## 2.8 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 C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

## 2.9 CONCRETE MIXTURE MATERIALS

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
  - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland or hydraulic cement in concrete assigned to Exposure Class F3 as follows:
  - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
  - 2. Slag Cement: 50 percent by mass.
  - 3. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
  - 4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
  - 1. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

## 2.10 CONCRETE MIXTURE CLASS TYPES

- A. Class A: Normal-weight concrete used for pile caps, grade beams, and tie beams.
  - 1. Exposure Class: ACI 318 Class F1, Class S1, Class W0, Class C1.
  - 2. Minimum Compressive Strength: 4000 psi or 3000 psi as indicated at 28 days.
  - 3. Maximum w/cm Ratio: 0.50.
  - 4. Slump Limit: Maximum 9 inches, plus or minus 1-1/2 inches for concrete.
  - 5. Air Content:
    - a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.

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6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cementitious materials.
  7. Compressive strength or alternative methods of estimating in-place strength of concrete by maturity or other nondestructive testing with acceptable correlation between test results and concrete compressive strength 2800 psi at 7 days.
- B. Class B: Normal-weight concrete used for footings, foundation walls, and post bases.
1. Exposure Class: ACI 318 Class F1, Class S0, Class W1, Class C1.
  2. Minimum Compressive Strength: 4000 psi at 28 days.
  3. Maximum w/cm Ratio : 0.50.
  4. Slump Limit: 5 inches, plus or minus 1 inch maximum for concrete.
  5. Air Content:
    - a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
  6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- C. Class C: Normal-weight concrete used for interior slabs-on-ground.
1. Exposure Class: ACI 318 Class F0, Class S0, Class W0, Class C0.
  2. Minimum Compressive Strength: 4500 psi at 28 days.
  3. Maximum w/cm Ratio : 0.50.
  4. Slump Limit: maximum 9 inches, plus or minus 1.5 inches for concrete.
  5. Air Content:
    - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
  6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
- D. Class J: Normal-weight concrete used for exterior slabs-on-ground, sidewalks, and equipment pads.
1. Exposure Class: ACI 318 Class F3, Class S1, Class W1, Class C2.
  2. Minimum Compressive Strength: 5000 psi at 28 days.
  3. Maximum w/cm Ratio: 0.40.
  4. Slump Limit: maximum 5 inches, plus or minus 1 inch for concrete.
  5. Air Content:
    - a. Exposure Classes F2 and F3: 6.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
  6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

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2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
  - 1. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.
  - 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
  - 1. Daily access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
  - 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 TOLERANCES

- A. Comply with ACI 117.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
  - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install reglets to receive waterproofing and through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.



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### 3.5 INSTALLATION OF VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
  - 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
  - 2. Face laps away from exposed direction of concrete pour.
  - 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
  - 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
  - 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
  - 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
  - 7. Protect vapor retarder during placement of reinforcement and concrete.
    - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides and sealing to vapor retarder.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

### 3.6 INSTALLATION OF CAST-IN-PLACE CONCRETE

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
  - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
  - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
  - 1. If a section cannot be placed continuously, provide construction joints as indicated.
  - 2. Deposit concrete to avoid segregation.
  - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
    - a. Do not use vibrators to transport concrete inside forms.
    - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

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- d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Do not place concrete floors and slabs in a checkerboard sequence.
  - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 3. Maintain reinforcement in position on chairs during concrete placement.
  - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 5. Level concrete, cut high areas, and fill low areas.
  - 6. Slope surfaces uniformly to drains where required.
  - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
  - 8. Do not further disturb slab surfaces before starting finishing operations.

### 3.7 INSTALLATION OF JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
  - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
  - 2. Place joints perpendicular to main reinforcement.
    - a. Continue reinforcement across construction joints unless otherwise indicated.
  - 3. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  - 5. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
  - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
  - 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  - 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action

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does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
  - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
  - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints:
  - 1. Install dowel bars and support assemblies at joints where indicated on Drawings.
  - 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.
- F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

### 3.8 APPLICATION OF FINISHING FLOORS AND SLABS

- A. Scratch Finish:
  - 1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
  - 2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
  - 3. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.
- B. Float Finish:
  - 1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
  - 2. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
  - 3. Apply float finish to surfaces to receive trowel finish.
- C. Trowel Finish:
  - 1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
  - 2. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance.
  - 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 4. Do not add water to concrete surface. Use of an approved finishing aid is acceptable.

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5. Do not apply troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

a. Slabs on Ground:

- 1) 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.

- D. Trowel and Fine-Broom Finish: First apply a trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with a fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

### 3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling in:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to match color and texture with in-place construction exposed to view.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

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5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.
  - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - b. Cast anchor-bolt insert into bases.
  - c. Install anchor bolts to elevations required for proper attachment to supported equipment.

### 3.10 APPLICATION OF CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
  1. Comply with ACI 301 for cold weather protection during curing.
  2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
  3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305R, before and during finishing operations.
- B. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
  1. Begin curing after finishing concrete.
  2. Interior Concrete Floors:
    - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
      - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
        - a) Lap edges and ends of absorptive cover not less than 12 inches.
        - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
      - 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.
        - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
        - b) Cure for not less than seven days.
      - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following not in cold weather:
        - a) Water.
        - b) Continuous water-fog spray.

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- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
  - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
    - a) Lap edges and ends of absorptive cover not less than 12 inches.
    - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
  - 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.
    - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
    - b) Cure for not less than seven days.
  - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
    - a) Water.
    - b) Continuous water-fog spray.
- c. Floors To Receive Urethane Flooring:
  - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
  - 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
  - 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
  - 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

### 3.11 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
  - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  - 2. Do not apply to concrete that is less than 28 days' old.
  - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
  - 4. Rinse with water; remove excess material until surface is dry.
  - 5. Apply a second coat in a similar manner if surface has received a float finish or abrasive surface preparation.

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- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

### 3.12 INSTALLATION OF JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
  - 1. Defer joint filling until concrete has aged at least six months.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.
- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

### 3.13 INSTALLATION OF CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
  - 1. Repair and patch defective areas when approved by Architect.
  - 2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks in excess of 0.01 inch spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, 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 to solid concrete.
    - a. Limit cut depth to 3/4 inch.
    - b. Make edges of cuts perpendicular to concrete surface.
    - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    - d. Fill and compact with patching mortar before bonding agent has dried.
    - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
    - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    - b. Compact mortar in place and match surrounding surface.



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3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
  - a. Correct low and high areas.
  - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.
  - a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
  - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  - b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
  - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
  - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
  - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
  - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
  - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
  - d. Place, compact, and finish to blend with adjacent finished concrete.
  - e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
  - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.



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- b. Dampen cleaned concrete surfaces and apply bonding agent.
  - c. Place patching mortar before bonding agent has dried.
  - d. Compact patching mortar and finish to match adjacent concrete.
  - e. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.14 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
  - 1. Testing agency to be responsible for providing curing facility for initial curing of strength test specimens on-site and verifying that test specimens are cured in accordance with standard curing requirements in ASTM C31/C31M.
  - 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
  - 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
      - 1) Project name.
      - 2) Name of testing agency.
      - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
      - 4) Name of concrete manufacturer.
      - 5) Date and time of inspection, sampling, and field testing.
      - 6) Date and time of concrete placement.
      - 7) Location in Work of concrete represented by samples.
      - 8) Date and time sample was obtained.
      - 9) Truck and batch ticket numbers.
      - 10) Design compressive strength at 28 days.
      - 11) Concrete mixture designation, proportions, and materials.
      - 12) Field test results of fresh concrete, including slump or slump flow, air content, temperature and density.
      - 13) Information on storage and curing of samples at the Project site, including curing method and maximum and minimum temperatures during initial curing period.
      - 14) Type of fracture and compressive break strengths at seven days and 28 days.
  - 4. Provide a space and source of power or other resources for curing and access to test specimens by the testing agency.

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- C. Delivery Tickets: comply with ASTM C94/C94M.
- D. Inspections:
  - 1. Headed bolts and studs.
  - 2. Verification of use of required design mixture.
  - 3. Concrete placement, including conveying and depositing.
  - 4. Curing procedures and maintenance of curing temperature.
  - 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
  - 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
  - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 150 cu. yd. or fraction thereof.
    - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing is to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C143/C143M:
    - a. One test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    - b. Perform additional tests as needed.
  - 3. Slump Flow: ASTM C1611/C1611M:
    - a. One test at point of delivery for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
    - b. Perform additional tests as needed.
  - 4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.
    - a. One test for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
  - 5. Concrete Temperature: ASTM C1064/C1064M:
    - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample when strength test specimens are cast.
  - 6. Concrete Density: ASTM C138/C138M:
    - a. One test for each composite sample when strength test specimens are cast.
  - 7. Compression Test Specimens: ASTM C31/C31M:

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- a. Cast and standard cure two sets of three 6 inches by 12-inches or 4-inch by 8-inch cylindrical specimens for each composite sample.
  - b. Cast, and field cure two sets of three standard cylindrical specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
  - a. Test one set of three standard cured specimens at seven days and one set of two specimens at 28 days.
  - b. Test one set of three field-cured specimens at seven days and one set of two specimens at 28 days.
  - c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests of standard cured cylinders equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
11. 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.
12. Additional Tests:
  - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
  - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
    - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.7.6.3.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

### 3.15 PROTECTION

- A. Protect concrete surfaces as follows:
  1. Protect from petroleum stains.
  2. Diaper hydraulic equipment used over concrete surfaces.

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3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using floor slab protective covering.

END OF SECTION

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SECTION 044200 - EXTERIOR STONE CLADDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone panels set with individual anchors.
2. Stone trim units, including sills.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for steel stud frames supporting stone cladding.

1.2 DEFINITIONS

- A. Definitions contained in ASTM C119 apply to this Section.
- B. IBC: International Building Code.
- C. Stone Cladding Assembly: An exterior wall covering system consisting of stone panels and trim together with anchors, mortar, fasteners, and sealants used to secure the stone to the building structure and to produce a weather-resistant covering.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each variety of stone, stone accessory, and manufactured product.
- C. Shop Drawings: Show fabrication and installation details for stone cladding assembly, including dimensions and profiles of stone units.
  1. Show locations and details of joints both within stone cladding assembly and between stone cladding assembly and other construction.
  2. Include details of mortar joints.
  3. Show locations and details of anchors.
  4. Show direction of veining, grain, or other directional pattern.
  5. Include large-scale shaded elevations and details of decorative surfaces and inscriptions.

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- D. Samples for Initial Selection: For joint materials involving color selection.
- E. Stone Samples for Verification: Sets for each variety, color, and finish of stone required; not less than 12 inches square.
  - 1. Sets consist of at least three Samples, exhibiting extremes of the full range of color and other visual characteristics expected and will establish the standard by which stone will be judged.
- F. Colored Pointing Mortar Samples for Verification: For each color required. Make Samples using same sand and mortar ingredients to be used on Project.
- G. Delegated Design Submittal: Shop Drawings including wall framing, reinforcement, blocking, stone anchor layout and anchor capacity.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Qualification Data: For Installer and professional engineer.
- C. Material Test Reports:
  - 1. Stone Test Reports: For stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous five years.
  - 2. For metal components, by a qualified testing agency, indicating chemical and physical properties of metal.
- D. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual experienced in installing stone cladding assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
  - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.

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2. Store stone on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store aggregates in locations where grading and other required characteristics can be maintained and where contamination can be avoided.

## 1.8 FIELD CONDITIONS

- A. Protect stone cladding during erection by doing the following:
  1. Cover tops of stone cladding installation with nonstaining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.
  2. Prevent staining of stone from mortar, grout, sealants, and other sources. Immediately remove such materials without damaging stone.
  3. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
  4. Protect sills, ledges, and projections from mortar and sealant droppings.
- B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace stone cladding damaged by frost or freezing conditions. Comply with cold-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.
- C. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.

## 1.9 COORDINATION

- A. Time delivery and installation of stone cladding to avoid extended on-site storage and to coordinate with work adjacent to stone cladding.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain stone from single quarry with resources to provide materials of consistent quality in appearance and physical properties.

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- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.
- C. Source Limitations for Other Materials: Obtain each type of stone accessory and other material from single manufacturer for each product.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stone cladding, wall framing, reinforcement, blocking, stone anchor layout and anchor capacity.
- B. General: Design stone anchors and anchoring systems according to ASTM C1242.
  - 1. Stone anchors withstand not less than two times the weight of the stone cladding in both compression and tension.
- C. Structural Performance: Stone cladding assembly withstands the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Wind Loads: As indicated.
- D. Seismic Performance: Stone cladding assembly withstands the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. Component Importance Factor: 1.0.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- F. Horizontal Building Movement (Interstory Drift): Allow for maximum horizontal building movement equal to quotient resulting from dividing floor-to-floor height at any floor by 400.
- G. Safety Factors for Stone: Design stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:
  - 1. Safety Factor for Granite: 3.
  - 2. Safety Factor for Concentrated Stresses: 4 for granite.
- H. Design stone anchors and backup structure to withstand loads indicated without exceeding allowable working stresses established by the following:
  - 1. For Structural Steel: AISC 360.
  - 2. For Cold-Formed Steel: AISI's "North American Specification and Commentary for the Design of Cold-Formed Steel Structural Members."



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- I. Provisions for Fabrication and Erection Tolerances: Allow for fabrication and erection tolerances of building's structural system. Structural-steel fabrication and erection tolerances are specified in Section 051200 "Structural Steel Framing."
- J. Provision for Deflection of Building Structure:
  - 1. Deflection Due to Weight of Stone Cladding Assembly: Allow for 1/4-inch vertical deflection in 20-foot span of structural members supporting stone cladding assembly.
  - 2. Live Load Deflection: Allow for 1/4-inch vertical deflection, in 20-foot span of structural members supporting stone cladding assembly, due to live loads imposed on building's structural frame after stone installation.
- K. Corrosion and Staining Control: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Materials do not stain exposed surfaces of stone and joint materials.

## 2.3 GRANITE

- A. Material Standard: Comply with ASTM C615/C615M.
- B. Description: Uniform, medium-grained, gray stone.
- C. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- D. Finish: Match existing.
- E. Match existing color, finish, and other stone characteristics relating to aesthetic effects. The existing stone is Deer Isle Granite.
- F. Thickness: Not less than 4 inches unless otherwise indicated.

## 2.4 ANCHORS AND FASTENERS

- A. Fabricate anchors, including shelf angles, from stainless steel, ASTM A240/A240M or ASTM A666, Type 304; temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A276, Type 304.
- B. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.
  - 1. For stainless steel, use annealed stainless steel bolts, nuts, and washers; for bolts, ASTM F593; and for nuts, ASTM F594, Alloy Group 1.
- C. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene washer, No. 10 (4.8-mm diameter) by length required to penetrate steel-stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours in accordance with ASTM B117.

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## 2.5 MORTAR MATERIALS

- A. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix produces color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments do not exceed 10 percent of portland cement by weight.
  - 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. Heidelberg Materials.
    - b. Holcim (US) Inc.
    - c. Lafarge North America Inc.
- B. Aggregate: ASTM C144; except for joints narrower than 1/4 inch and pointing mortar, 100 percent pass No. 16 sieve.
  - 1. White Aggregates: Natural white sand or ground white stone.
  - 2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.
- C. Water: Potable.

## 2.6 STONE ACCESSORIES

- A. Setting Shims: Strips of resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.
- B. Concealed Sheet Metal Flashing: Fabricated from stainless steel in thicknesses indicated, but not less than 0.0156 inch thick, and complying with Section 076200 "Sheet Metal Flashing and Trim."
- C. Cellular Plastic Weep Hole/Vents: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, of length required to extend from exterior face of stone to cavity behind, in color selected from manufacturer's standard.
- D. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, of length required to extend from exterior face of stone to cavity behind, in color selected from manufacturer's standard.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Advanced Building Products Inc.

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- b. [CavClear; a division of Archovations, Inc.](#)
  - c. [Mortar Net Solutions.](#)
2. Provide one of the following configurations:
- a. Strips, full depth of cavity and 10 inches wide, with dovetail-shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.
  - b. Strips, not less than 1-1/2 inches thick and 10 inches wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.

## 2.7 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.
- 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. [Diedrich Technologies, Inc.; a Hohmann & Barnard company.](#)
    - b. [EaCo Chem, Inc.](#)
    - c. [Hydroclean; Hydrochemical Techniques, Inc.](#)
    - d. [PROSOCO, Inc.](#)

## 2.8 FABRICATION OF STONE

- A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.
  - 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
- B. Control depth of stone and back check to maintain minimum clearance of 1-1/2 inches between backs of stone units and surfaces of backup walls, and other work behind stone.
- C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.
- D. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.
- E. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples.
- F. Cut stone to produce uniform joints to match existing and in locations indicated.

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- G. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
- H. Clean backs of stone to remove rust stains, iron particles, and stone dust.
- I. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
  - 1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.

## 2.9 MORTAR MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
  - 1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
  - 2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.
- B. Portland Cement-Lime Setting Mortar: Comply with ASTM C270, Proportion Specification, Type N.
- C. Pointing Mortar: Comply with ASTM C270, Proportion Specification, Type N:
  - 1. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to receive stone cladding and conditions under which stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone cladding.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone cladding.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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### 3.2 INSTALLATION OF STONE CLADDING, GENERAL

- A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- B. Execute stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.
  - 1. Use power saws with diamond blades to cut stone. Produce lines cut straight and true, with edges eased slightly to prevent snipping.
- C. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.
- D. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.
- E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
  - 1. Sealing expansion and other joints is specified in Section 079200 "Joint Sealants."
  - 2. Keep expansion joints free of mortar and other rigid materials.
- F. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water, to divert water to building exterior. Extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
- G. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.
  - 1. Insert cavity drainage material.
  - 2. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and above shelf angles and flashing. Locate weep holes at intervals not exceeding 24 inches. Use plastic weep hole/vents.
  - 3. Place vents in cavity walls at tops of cavities, below shelf angles and flashing, and at intervals not exceeding 20 feet vertically. Locate vents in joints at intervals not exceeding 60 inches horizontally. Use plastic weep hole/vents.

### 3.3 INSTALLATION OF MECHANICALLY ANCHORED STONE CLADDING

- A. Set stone cladding with mechanical anchors without mortar unless otherwise indicated.
- B. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C1242.

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- C. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.
- D. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

### 3.4 INSTALLATION OF STONE CLADDING WITH MORTAR

- A. Set stone cladding with mortar and mechanical anchors unless otherwise indicated.
- B. Set stone in full bed of mortar with head joints filled unless otherwise indicated.
  - 1. Use setting buttons of adequate size, in sufficient quantity, and of thickness required to maintain uniform joint width and to prevent mortar from extruding. Hold buttons back from face of stone a distance at least equal to width of joint, but not less than depth of pointing materials.
  - 2. Do not set heavy units or projecting courses until mortar in courses below has hardened enough to resist being squeezed out of joint.
  - 3. Support and brace projecting stones until wall above is in place and mortar has set.
  - 4. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.
- C. Embed ends of sills in mortar; leave remainder of joint open until final pointing.
- D. Rake out joints for pointing with mortar to depths of not less than 1/2 inch. Rake joints to uniform depths with square bottoms and clean sides.
- E. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply first layer of pointing mortar in layers not more than 3/8 inch until a uniform depth is formed.
- F. Point stone joints by placing pointing mortar in layers not more than 3/8 inch. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- G. Tool joints with a round jointer having a diameter 1/8 inch larger than width of joint, when pointing mortar is thumbprint hard.

### 3.5 INSTALLATION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, corners and jambs within 20 feet of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch in 40 feet or more.
- B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.

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- C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 inch.
- E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch or a quarter of nominal joint width, whichever is less. For joints within 60 inches of each other, do not vary more than 1/8 inch or a quarter of nominal joint width, whichever is less from one to the other.
- F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and stone cladding that does not match approved samples. Damaged stone may be repaired if Architect approves methods and results.
- B. Replace damaged or defective work in a manner that results in stone cladding's matching approved samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stone cladding as work progresses. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: Clean stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION

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SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel materials.
2. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other steel items not defined as structural steel.
2. Section 099600 "High-Performance Coatings" and Section 099123 "Interior Painting" for painting requirements.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of 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.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.



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B. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Threaded rods.
5. Forged-steel hardware.
6. Shop primer.
7. Galvanized-steel primer.
8. Etching cleaner.
9. Galvanized repair paint.
10. Shrinkage-resistant grout.

C. 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. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members not to be shop primed.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M 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.

E. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data.

## 1.6 INFORMATIONAL SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Qualification Data: For Installer, fabricator, professional engineer, and testing agency.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Mill test reports for structural-steel materials, including chemical and physical properties.

F. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.

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- 3. Tension-control, high-strength, bolt-nut-washer assemblies.
- G. Survey of existing conditions.
- H. Source quality-control reports.
- I. Field quality-control reports.

#### 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Shop-Painting Applicator Qualifications: Qualified in accordance with AISC's Sophisticated Paint Endorsement P3 or to SSPC-QP 3.
- D. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
  - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds are to pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G are to be considered separate processes for welding personnel qualification.

#### 1.8 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 F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
  - 1. ANSI/AISC 303.
  - 2. ANSI/AISC 341.
  - 3. ANSI/AISC 360.
  - 4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- B. Connection Design Information:
  - 1. Option 1: Connection designs have been completed and connections indicated on the Drawings.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992/A992M.
- B. Channels, Angles, M-Shapes: ASTM A36/A36M.
- C. Plate and Bar: ASTM A36/A36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.
- E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
  - 1. Weight Class: Standard.
  - 2. Finish: Black except where indicated to be galvanized.
- F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
  - 1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.
- B. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
  - 1. Finish: Hot-dip zinc coating.
  - 2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating mechanically deposited zinc coating, baked epoxy-coated finish.

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- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex or round head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

- 1. Finish: Mechanically deposited zinc coating.

## 2.4 RODS

- A. Headed Anchor Rods: ASTM F1554, Grade 55, weldable, straight.

- 1. Nuts: ASTM A563 heavy-hex carbon steel.
- 2. Plate Washers: ASTM A36/A36M carbon steel.
- 3. Washers: ASTM F436, Type 1, hardened carbon steel.
- 4. Finish: Plain.

- B. Threaded Rods: ASTM A36/A36M.

- 1. Nuts: ASTM A63 heavy-hex carbon steel.
- 2. Washers: ASTM A36/A36M carbon steel.
- 3. Finish: Mechanically deposited zinc coating, ASTM B695, Class 50.

## 2.5 FORGED-STEEL STRUCTURAL HARDWARE

- A. Clevises and Turnbuckles: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1035.
- B. Eye Bolts and Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1030.
- C. Sleeve Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1018.

## 2.6 PRIMER

- A. Steel Primer:

- 1. Comply with Section 099600 "High Performance Coatings" and Section 099123 "Interior Painting."
- 2. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

- B. Galvanized-Steel Primer: MPI#26, MPI#80, and MPI#134.

- 1. Etching Cleaner: MPI#25, for galvanized steel.
- 2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 and ASTM A780/A780M.

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## 2.7 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.8 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
  - 1. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
  - 2. Mark and match-mark materials for field assembly.
  - 3. 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/D1.1M.
- 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 in accordance with SSPC-SP 1.
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces.
  - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.9 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M 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 maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

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2.10 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
  - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
  - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.11 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
  - 1. Surfaces to be field welded.
  - 2. Surfaces of high-strength bolted, slip-critical connections.
  - 3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  - 4. Galvanized surfaces.
  - 5. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
  - 1. SSPC-SP 2.
  - 2. SSPC-SP 3.
- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.
- D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC 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.

2.12 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
  - 1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
  - 2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
  - 3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

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- a. Liquid Penetrant Inspection: ASTM E165/E165M.
  - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
  - c. Ultrasonic Inspection: ASTM E164.
  - d. Radiographic Inspection: ASTM E94/E94M.
4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
- a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
  - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.
5. Prepare test and inspection reports.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
  - 1. Prepare a certified survey of existing conditions. Include 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 on Drawings.
  - 1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

#### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

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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 shrinkage-resistant 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 grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- 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 are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
  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.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
  3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

### 3.5 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:



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1. 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.
  - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Cleaning and touchup painting is specified in Section 099123 "Interior Painting."
- C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

### 3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
  1. Verify structural-steel materials and inspect steel frame joint details.
  2. Verify weld materials and inspect welds.
  3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
  1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
  2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
    - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      - 1) Liquid Penetrant Inspection: ASTM E165/E165M.
      - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      - 3) Ultrasonic Inspection: ASTM E164.
      - 4) Radiographic Inspection: ASTM E94/E94M.
  3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
    - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
    - b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION

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SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. K-series steel joist substitutes.
3. Steel joist girders.
4. Steel joist accessories.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.2 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of joist, accessory, and product.
- C. Shop Drawings:
1. Include layout, designation, number, type, location, and spacing of joists.
  2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
  3. Indicate locations and details of bearing plates to be embedded in other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For manufacturer and professional engineer.
- C. Welding certificates.

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- D. Manufacturer certificates.
- E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- F. Mill Certificates: For each type of bolt.
- G. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- H. Field quality-control reports.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
  - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.6 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 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. Canam Buildings US Inc.; Canam Group Inc.
  - 2. Gooder-Henrichsen Co.
  - 3. New Millennium Building Systems, LLC.
  - 4. Valley Joist.
  - 5. Vulcraft/Verco Group; a division of Nucor Corp.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated on Drawings.
  - 1. Use ASD; data are given at service-load level.

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2. Design special joists to withstand design loads with live-load deflections no greater than the following:
  - a. Roof Joists: Vertical deflection of  $1/360$  (LL), and  $1/240$  (TL) of the span.

## 2.3 STEEL JOISTS

- A. K-Series Steel Joist: Manufactured steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
  1. Joist Type: K-series steel joists.
  2. K-Series Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
  3. Provide holes in chord members for connecting and securing other construction to joists.
  4. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated on Drawings, complying with SJI's "Specifications."
  5. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated on Drawings, complying with SJI's "Specifications."
  6. Camber joists according to SJI's "Specifications."
  7. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds  $1/4$  inch per 12 inches.

## 2.4 PRIMERS

- A. Primer:
  1. SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
  2. Provide shop primer that complies with Section 099123 "Interior Painting."

## 2.5 STEEL JOIST ACCESSORIES

- A. Bridging:
  1. Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
  2. Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
  3. Fabricate as indicated on Drawings and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- B. Fabricate steel bearing plates from ASTM A36/A36M steel with integral anchorages of sizes and thicknesses indicated on Drawings. Shop prime paint.
- C. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."

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- D. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction.
  - 1. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated on Drawings.
  - 2. Finish: Plain, uncoated.
- E. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
  - 1. Finish: Plain.
- F. Welding Electrodes: Comply with AWS standards.
- G. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

## 2.6 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 or power-tool cleaning, SSPC-SP 3.
- 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 thick.
- D. Shop priming of joists and joist accessories is specified in Section 099123 "Interior Painting."

## 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 of the Work.
- 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 instructions, and requirements in this Section.
  - 1. Before installation, splice joists delivered to Project site in more than one piece.
  - 2. Space, adjust, and align joists accurately in location before permanently fastening.

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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 weld joists to supporting steel framework. 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. Bolt joists to supporting steel framework using carbon-steel bolts.
  - E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
  - F. 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 REPAIRS

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Touchup Painting:
  1. Immediately after installation, clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
    - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
    - b. Apply a compatible primer of same type as primer used on adjacent surfaces.
  2. Cleaning and touchup painting are specified in Section 099123 "Interior Painting."

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
- C. Visually inspect bolted connections.
- D. Prepare test and inspection reports.

END OF SECTION

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SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Roof deck.

C. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Welding certificates.

C. Product Certificates: For each type of steel deck.

D. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
  - a. Power-actuated mechanical fasteners.
2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

E. Field Quality-Control Submittals:

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1. Field quality-control reports.

F. Qualification Statements: For welding personnel and testing agency.

#### 1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:

1. AWS D1.1/D1.1M.
2. AWS D1.3/D1.3M.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

B. Fire-Resistance Ratings: Comply with ASTM E119; 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 listings of another qualified testing agency.

#### 2.2 ROOF DECK

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. ASC Steel Deck; ASC Profiles, LLC.
2. CSM Metal Deck.
3. Canam Buildings US Inc.; Canam Group Inc.
4. Cordeck.
5. DACS, Inc.
6. Epic Metals Corporation.



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7. [Marlyn Steel Decks, Inc.](#)
8. [Miami Metal Deck.](#)
9. [New Millennium Building Systems, LLC.](#)
10. [OEG Building Materials Inc.](#)
11. [Roof Deck, Inc.](#)
12. [Tristate Decking, Inc.](#)
13. [Valley Joist.](#)
14. [Vercor Decking, Inc.; a Nucor company.](#)
15. [Vulcraft Group; Division of Nucor Corp.](#)
16. [Vulcraft/Vercor Group; a division of Nucor Corp.](#)

B. Fabrication of Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:

1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 40 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
  - a. Color: Manufacturer's standard.
2. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 40, G60 zinc coating.
3. Galvanized- and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 40, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
  - a. Color: Manufacturer's standard.
4. Deck Profile: As indicated.
5. Profile Depth: As indicated.
6. Design Uncoated-Steel Thickness: As indicated.
7. Span Condition: As indicated.
8. Side Laps: Overlapped.

## 2.3 ACCESSORIES

- A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. 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.
- E. Galvanizing Repair Paint: ASTM A780/A780M, SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.
- F. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

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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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
  - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install in accordance with deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOF DECK

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
  - 1. Weld Diameter: 5/8 inch, nominal.
  - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.

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- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:
  - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
  - 2. Mechanically clinch or button punch.
- 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: Lapped 2 inches minimum.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
  - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.

### 3.4 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.
- B. Repair Painting:
  - 1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
  - 2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
  - 3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099123 "Interior Painting."
  - 4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099123 "Interior Painting."

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
  - 1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.
    - a. Field welds will be subject to inspection.

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2. Steel decking will be considered defective if it does not pass tests and inspections.
  3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
    - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
    - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors that are already tested.
- C. Prepare test and inspection reports.

END OF SECTION

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SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.
2. Interior non-load-bearing wall framing.
3. Ceiling joist framing.
4. Soffit framing.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.
3. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing.
4. Vertical deflection clips.
5. Single deflection track.
6. Ceiling joist framing.
7. Soffit framing.
8. Post-installed anchors.
9. Power-actuated anchors.
10. Sill sealer gasket.
11. Sill sealer gasket/termite barrier.

C. Shop Drawings:

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1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. Delegated Design Submittal: For cold-formed steel framing.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For testing agency.
- C. Product Certificates: For each type of code-compliance certification for studs and tracks.
- D. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
  1. Steel sheet.
  2. Expansion anchors.
  3. Power-actuated anchors.
  4. Mechanical fasteners.
  5. Vertical deflection clips.
  6. Miscellaneous structural clips and accessories.
- E. Research Reports:
  1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
  2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. 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-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Stud Manufacturers Association.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

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. AllSteel & Gypsum Products, Inc.
2. CEMCO; California Expanded Metal Products Co.
3. CRACO Mfg., Inc.
4. ClarkDietrich.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Design Shapes in Steel.
7. Formetal Co. Inc. (The).
8. Jaimes Industries, Inc.
9. MBA Metal Framing.
10. MRI Steel Framing, LLC.
11. Marino\WARE.
12. Mill Steel Framing; Mill Steel Company.
13. Olmar Supply, Inc.
14. Quail Run Building Materials, Inc.
15. SCAFCO Steel Stud Company; Stone Group of Companies.
16. State Building Products, Inc.
17. Steel Construction Systems; Stone Group of Companies.
18. Steel Network, Inc. (The).
19. Steeler, Inc.
20. Super Stud Building Products Inc.
21. TELLING Industries.
22. The Mill Steel Co.

2.2 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 on Drawings.
  2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
    - b. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft..

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3. Design framing systems to provide for movement of framing members located outside the insulated building envelope 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 inch.
5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and AISI S200 and ASTM C955, Section 8.
- D. Fire-Resistance Ratings: Comply with ASTM E119; 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 acceptable to authorities having jurisdiction.

## 2.3 COLD-FORMED STEEL FRAMING MATERIALS

- A. Framing Members, General: Comply with AISI S200 and ASTM C955, Section 8 for conditions indicated.
- B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
  1. Grade: As required by structural performance.
  2. Coating: G60.
- C. Steel Sheet for Vertical Deflection Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
  1. Grade: 50, Class 1.
  2. Coating: G60.

## 2.4 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-Metal Thickness: 0.0428 inch.
  2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0428 inch.



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2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips, Exterior: 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. 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. AllSteel & Gypsum Products, Inc.
    - b. CRACO Mfg., Inc.
    - c. ClarkDietrich.
    - d. Marino\WARE.
    - e. SCAFCO Steel Stud Company; Stone Group of Companies.
    - f. Steel Construction Systems; Stone Group of Companies.
    - g. Steel Network, Inc. (The).
- 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-Metal Thickness: 0.0538 inch.
  2. Flange Width: 1 inch plus the design gap for one-story structures.

## 2.5 INTERIOR 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-Metal Thickness: 0.0329 inch.
  2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0329 inch.
  2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips, Interior: 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. 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. AllSteel & Gypsum Products, Inc.
    - b. CRACO Mfg., Inc.
    - c. ClarkDietrich.
    - d. Marino\WARE.

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- e. SCAFCO Steel Stud Company; Stone Group of Companies.
- f. Steeler, 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-Metal Thickness: 0.0428 inch.
- 2. Flange Width: 1 inch plus the design gap for one-story structures.

## 2.6 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:

- 1. Minimum Base-Metal Thickness: 0.0329 inch.
- 2. Flange Width: 1-5/8 inches, minimum.

## 2.7 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

- 1. Minimum Base-Metal Thickness: 0.0329 inch.
- 2. Flange Width: 1-5/8 inches, minimum.

## 2.8 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation 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. Anchor clips.
- 4. End clips.
- 5. Foundation clips.
- 6. Stud kickers and knee braces.
- 7. Backer plates.

## 2.9 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

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- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.
  - 1. Uses: Securing cold-formed steel framing to structure.
  - 2. Type: Torque-controlled expansion anchor or adhesive anchor.
  - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
  - 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

## 2.10 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M, MIL-P-21035B, or SSPC-Paint 20.
- B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.
- D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.
- F. Sill Sealer Gasket/Termite Barrier: Minimum 68-mil nominal thickness, self-adhering sheet consisting of 64 mils of rubberized asphalt laminated on one side to a 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
  - 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. Polyguard Products, Inc.
  - 2. Physical Properties:

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- a. Peel Adhesion: 17.0 lb/in of width when tested in accordance with ASTM D412.
- b. Low-Temperature Flexibility: Pass at minus 25 deg F when tested in accordance with ASTM D146/D146M.
- c. Water Vapor Permeance: 0.05 perm maximum when tested in accordance with ASTM E96/E96M, Method B.
- d. Resistance to Termite Penetration: Comply with ICC-ES AC380.

## 2.11 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 screw fastening.
    - a. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
  - 4. Fasten other materials to cold-formed steel framing by 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 by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to 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.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

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- 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 required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.
- C. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.
- D. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at 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 S200, AISI S202, and 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.
- 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/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners, install according to Shop Drawings, and comply 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 equal 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 joints with cold-formed steel framing. Independently frame both sides of joints.

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- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly 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 approved or standard punched openings.

### 3.4 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: 16 inches and as indicated on Shop Drawings.
- 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.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
  - 1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.5 INSTALLATION OF INTERIOR NONLOADBEARING WALL FRAMING

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:

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1. Stud Spacing: 16 inches and as indicated on Shop Drawings.
- 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.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
  1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.6 INSTALLATION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.7 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

### 3.8 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.

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- 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. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTION

- A. 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



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SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous framing and supports.
2. Shelf angles.
3. Miscellaneous steel trim.
4. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 051200 "Structural Steel Framing" for steel framing, supports, and other steel items attached to the structural-steel framing.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
1. Fasteners.
  2. Shop primers.
  3. Shrinkage-resisting grout.
- C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections,

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and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
2. Shelf angles.
3. Loose steel lintels.

D. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Mill Certificates: Certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research Reports: For post-installed anchors.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

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## 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.
- C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 316L.
- E. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 316L.
- F. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- G. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
  - 2. Galvanized Steel: ASTM A653/A653M, structural steel, Grade 33, with G90 coating; minimum 0.079-inch nominal thickness.
  - 3. Cold-Rolled Steel: ASTM A1008/A1008M, structural steel, Grade 33; minimum 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.
- I. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

## 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless steel fasteners for fastening aluminum and stainless steel.
  - 2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 2.
- E. Anchor Bolts: ASTM F1554, Grade 55, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

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1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors as indicated.
  1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
  2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

## 2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

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- H. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi as indicated.

## 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

## 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

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- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 5/8-inch bolts, spaced not more than 6 inches from ends and 36 inches o.c., unless otherwise indicated.
- B. Galvanize shelf angles located in exterior walls.
- C. Prime shelf angles located in interior walls with zinc-rich primer.
- D. Furnish adhesive epoxy concrete anchors, to attach shelf angles to cast-in-place concrete.

2.8 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe and as otherwise indicated.
  - 1. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
  - 2. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Prime plates with zinc-rich primer.

2.10 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 6 inches unless otherwise indicated.

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- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

## 2.11 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

## 2.12 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.13 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with primers specified in Section 099123 "Interior Painting" unless primers specified in Section 099600 "High-Performance Coatings" are indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
  - 5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

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1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

#### 3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor shelf angles securely to existing construction with adhesive epoxy anchors.
- C. Support steel girders on steel columns. Secure girders with bolts through top plates of pipe columns.
- D. Install columns on concrete foundation with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.
  1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.



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3.3 INSTALLATION OF SHELF ANGLES

- A. Install shelf angles as required to keep masonry level, at correct elevation, and flush with vertical plane.

3.4 INSTALLATION OF MISCELLANEOUS STEEL TRIM

- A. Anchor to concrete construction to comply with manufacturer's written instructions.

3.5 INSTALLATION OF METAL BOLLARDS

- A. Anchor bollards in concrete. Slope grout up approximately 1/8 inch toward bollard.

3.6 INSTALLATION OF LOOSE BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.7 REPAIRS

- A. Touchup Painting:
  - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
  - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

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SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum railings.

1.2 COORDINATION

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
1. For aluminum pipe or tubing.
  2. Bituminous paint.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- D. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Welding certificates.
- C. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

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1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 ALUMINUM RAILINGS

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

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- B. Aluminum, General: Provide alloy and temper recommended by aluminum fabricator for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- C. Extruded Bars and Tubing: ASTM B221, Alloy 6063-T5/T52.
- D. Extruded Structural Pipe and Round Tubing: ASTM B429/B429M, Alloy 6063-T6.
  - 1. Provide Extra Heavy Weight (Schedule 80) pipe unless otherwise indicated.
- E. Drawn Seamless Tubing: ASTM B210/B210M, Alloy 6063-T832.
- F. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.
- G. Castings: ASTM B26/B26M, Alloy A356.0-T6.

## 2.4 FASTENERS

- A. Fastener Materials:
  - 1. Aluminum Railing Components: Type 304 or Type 316 stainless steel fasteners.

## 2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
  - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
  - 1. Clearly mark units for reassembly and coordinated installation.
  - 2. Use connections that maintain structural value of joined pieces.

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- C. Cut, drill, and punch metals cleanly and accurately.
  - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
  - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water.
  - 1. Provide weep holes where water may accumulate.
  - 2. Locate weep holes in inconspicuous locations.
- F. Connections: Fabricate railings with welded connections unless otherwise indicated.
- G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
- H. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- I. Form changes in direction as follows:
  - 1. By coping and welding.
  - 2. By bending to smallest radius that will not result in distortion of railing member.
- J. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

## 2.7 ALUMINUM FINISHES

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are

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acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- B. Mill Finish: AA-M12, nonspecular as fabricated.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
  - 1. Fit exposed connections together to form tight, hairline joints.
  - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
  - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
  - 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  - 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
  - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

#### 3.2 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

#### 3.3 ANCHORING POSTS

- A. Core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in stone. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Cover anchorage joint with flange of same metal as post, attached to post with setscrews.

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3.4 CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.5 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

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SECTION 055813 - COLUMN COVERS

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 snap-together metal column covers.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product, including finishing materials.
- C. Shop Drawings: Show fabrication and installation details for column covers.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For fabricator.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver column covers wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

PART 2 - PRODUCTS

2.1 SNAP-TOGETHER COLUMN COVERS

- A. Manufacturers: Subject to compliance with requirements, provide PAC-1000F by PAC-CLAD, or a comparable product by one of the following:



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1. [Americald, LLC.](#)
2. [ATAS International, Inc.](#)
3. [Castle Metal Products.](#)
4. [Fry Reglet Corporation.](#)
5. [Metal Specialty Systems.](#)
6. [Metalwerks USA.](#)

B. Form column covers to shapes indicated from metal of type and minimum thickness indicated below. Return vertical edges and bend to form hook that engages continuous mounting clips.

1. Aluminum Sheet: ASTM B209, with not less than strength and durability properties of Alloy 5005-H32, 0.0125 inch thick.
  - a. Finish: High-performance organic coating.
2. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
3. Form returns at vertical joints to provide hairline V-joints.
4. Fabricate column covers without horizontal joints.
5. Fabricate base ring to match column covers.
6. Fabricate with a 6-inch recessed base.

## 2.2 MISCELLANEOUS MATERIALS

- A. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.
1. Provide concealed fasteners for interconnecting column covers and for attaching them to other work unless otherwise indicated.
  2. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.

## 2.3 FABRICATION, GENERAL

- A. Coordinate dimensions and attachment methods of column covers with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- B. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends.

## 2.4 GENERAL FINISH REQUIREMENTS

- A. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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- C. Apply organic finishes to formed metal after fabrication unless otherwise indicated.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.5 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

## 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 column covers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Locate and place column covers plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install column covers.
  - 1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- B. Use concealed anchorages where possible.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- D. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

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3.3 ADJUSTING AND CLEANING

- A. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

- A. Protect finishes from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION

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SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Miscellaneous lumber.
3. Plywood backing panels.

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. Lumber grading agencies, and abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
  2. NLGA: National Lumber Grades Authority.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.
  3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

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#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
  - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
  - 1. Boards: 15 percent.
  - 2. Dimension Lumber: 19 percent unless otherwise indicated.

#### 2.2 FIRE-RETARDANT-TREATED LUMBER

- A. General: Where fire-retardant-treated materials are indicated, materials are to comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
  - 1. Treatment is not to promote corrosion of metal fasteners.
  - 2. Exterior Type: Treated materials are to comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering in accordance with ASTM D2898. Use for exterior locations and where indicated.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

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- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency and other information required by authorities having jurisdiction.
- E. Application: Treat items indicated on Drawings, and the following:
  - 1. Plywood backing panels.

## 2.3 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
- B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.
- C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
  - 1. Hem-fir or hem-fir (north); Standard or No. 3 Common grade; NLGA.
  - 2. Eastern softwoods; No. 3 Common grade; NeLMA.
  - 3. Northern species; No. 3 Common grade; NLGA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

## 2.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

## 2.5 FASTENERS

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329.
- B. Nails: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
- F. Securely attach roofing nailers to substrates by anchoring and fastening to withstand bending, shear, or other stresses imparted by Project wind loads and fastener-resistance loads as designed in accordance with ASCE/SEI 7.
- G. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.

END OF SECTION

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SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Wall sheathing.

- C. Product Data Submittals: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

- A. Glass-Mat Gypsum Sheathing, Walls: ASTM C1177/C1177M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Certainteed; SAINT-GOBAIN.
  - b. Continental Building Products Inc.



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- c. Georgia-Pacific Gypsum LLC.
  - d. USG Corporation.
2. Type and Thickness: Regular, 1/2 inch thick.
  3. Size: 48 by 96 inches for vertical installation.

## 2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
  1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
  2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
  2. ICC-ES evaluation report for fastener.
- D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

### 3.2 INSTALLATION OF GYPSUM SHEATHING

- A. Comply with GA-253 and with manufacturer's written instructions.

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1. Fasten gypsum sheathing to cold-formed metal framing with screws.
  2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
  3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.

END OF SECTION

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SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Miscellaneous materials.

B. Related Requirements:

1. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Miscellaneous materials.

C. Product Data Submittals: For each product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

D. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

- E. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

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1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.
- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
  - 1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Environmental Limitations with Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## PART 2 - PRODUCTS

### 2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
  1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.
  2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Architectural Woodwork Standards Grade: Custom.
- C. Type of Construction: Face frame.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABET Inc.
    - b. Formica Corporation.
    - c. Laminart LLC.
    - d. Pionite; a Panolam Industries International, Inc. brand.
    - e. Wilsonart LLC.
- F. Exposed Surfaces:
  1. Plastic-Laminate Grade: HGS.
  2. Edges: Grade HGS.
  3. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- G. Semiexposed Surfaces:
  1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, ISO 4586-3.

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- a. Edges of Plastic-Laminate Shelves: PVC tape, 0.018-inch minimum thickness, matching laminate in color, pattern, and finish.
  - b. Edges of Thermally Fused Laminate Panel Shelves: PVC or polyester edge banding.
  - c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, ISO 4586-3, grade to match exposed surface.
- 2. Drawer Sides and Backs: Thermally fused laminate panels with PVC or polyester edge banding.
- 3. Drawer Bottoms: Thermally fused laminate panels.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, ISO 4583-3, grade to match exposed surface.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
  - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

## 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
  - 1. Wood Moisture Content: 4 to 9 percent.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
  - 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
  - 2. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of ISO 4586.

## 2.3 CABINET HARDWARE AND ACCESSORIES

- A. Cabinet Hardware: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Accuride International Inc.
    - b. CompX International, Inc.

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- c. [Grass America.](#)
    - d. [Hardware Resources.](#)
    - e. [Hettich America L.P.](#)
    - f. [Julius Blum & Co., Inc.](#)
    - g. [Knappe & Vogt Manufacturing Company.](#)
  - B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
  - C. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011.
  - D. Catches: Magnetic catches, ANSI/BHMA A156.9, B03141.
  - E. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081 ANSI/BHMA A156.9, B04102; with shelf brackets, B04112.
  - F. Shelf Rests: ANSI/BHMA A156.9, B04013; plastic.
  - G. Drawer Slides: ANSI/BHMA A156.9.
    - 1. Standard Duty (Grade 1 and Grade 2): Side mount.
    - 2. General-purpose drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide 75 lb load capacity.
  - H. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.
  - I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.
    - 1. Satin Brass, Blackened, Bright Relieved, Clear Coated: ANSI/BHMA 610 for brass base; ANSI/BHMA 636 for steel base.
    - 2. Satin Chromium Plated: ANSI/BHMA 626 for brass or bronze base; ANSI/BHMA 652 for steel base.
    - 3. Bright Chromium Plated: ANSI/BHMA 625 for brass or bronze base; ANSI/BHMA 651 for steel base.
    - 4. Satin Stainless Steel: ANSI/BHMA 630.
  - J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.
- 2.4 MISCELLANEOUS MATERIALS
- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
  - B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
  - C. Adhesive for Bonding Plastic Laminate: Type II water-resistant type as selected by fabricator to comply with requirements.

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1. Adhesive for Bonding Edges: Hot-melt adhesive.

## 2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
  2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

### 3.2 INSTALLATION

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
  1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.



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2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

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SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied, cut-back-asphalt dampproofing.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for bituminous vapor retarders under slabs-on-grade.
2. Section 042000 "Unit Masonry" for mortar parge coat on masonry surfaces.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.

1.3 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course and auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 PERFORMANCE REQUIREMENTS

- A. VOC Content: Products are to comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

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## 2.3 COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. APOC, Inc; a division of Gardner Industries.
  - 2. Brewer Company (The).
  - 3. Henry, a Carlisle Company (formerly Henry Company and Carlisle Coatings & Waterproofing Inc. brands).
  - 4. W. R. Meadows, Inc.
- B. Brush and Spray Coats: ASTM D4479/D4479M, Type I, fibered.

## 2.4 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Cut-Back-Asphalt Primer: ASTM D41/D41M.
- C. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- D. Asphalt-Coated Glass Fabric: ASTM D1668/D1668M, Type I.
- E. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.
- F. Smooth-surfaced roll roofing complying with ASTM D6380/D6380M, Class S, Type III.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for surface smoothness, maximum surface moisture content, and other conditions affecting performance of the Work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for dampproofing application.
- B. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

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- C. Clean substrates of projections and substances detrimental to dampproofing work; fill voids, seal joints, and remove bond breakers if any.
- D. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

### 3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.
  - 1. Apply dampproofing to provide continuous plane of protection.
  - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
  - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
  - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

### 3.4 INSTALLATION OF COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING

- A. Concrete Foundations and Parged Masonry Foundation Walls: Apply two brush or spray coats at not less than 1.25 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.

### 3.5 INSTALLATION OF PROTECTION COURSE

- A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.

### 3.6 PROTECTION

- A. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where panels are subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- B. Correct dampproofing that does not comply with requirements; repair substrates, and reapply dampproofing.

END OF SECTION

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SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mineral-wool blanket insulation.

B. Related Requirements:

1. Section 075419 "Polyvinyl-Chloride (PVC) Roofing" for insulation specified as part of roofing construction.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

- B. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

- C. Research Reports: For foam-plastic insulation, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

- B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than Class A, 25 and 450 when tested in accordance with ASTM E84.
- B. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- C. Thermal-Resistance Value (R-Value): R-value as indicated on Drawings.

2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION (XPS)

- A. Extruded Polystyrene Board Insulation, Type IV: ASTM C578, Type IV, 25 psi minimum compressive strength; unfaced.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. DiversiFoil Products.
    - b. DuPont de Nemours, Inc.
    - c. Kingspan Insulation LLC.
    - d. Owens Corning.
    - e. The Dow Chemical Company.

2.3 MINERAL-WOOL BLANKET INSULATION

- A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; complying with ASTM E136 for combustion characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Johns Manville; a Berkshire Hathaway company.
    - b. Owens Corning.
    - c. ROCKWOOL.

2.4 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
  - 1. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- B. Miscellaneous Application Accessories:

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1. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or those that interfere with insulation attachment.

#### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products, applications and applicable codes.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

#### 3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive in accordance with manufacturer's written instructions.
  1. If not otherwise indicated, extend insulation a minimum of 36 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units in accordance with manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
  1. If not otherwise indicated, extend insulation a minimum of 36 inches in from exterior walls.

#### 3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing in accordance with manufacturer's written instructions.

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3.5 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended in writing by manufacturer.
  - 1. Fit courses of insulation between obstructions, with edges butted tightly in both directions, and with faces flush.
  - 2. Press units firmly against inside substrates.

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Mineral-Wool Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
  - 2. Detailing Foam Insulation for Voids: Apply in accordance with manufacturer's written instructions.

3.7 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION



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SECTION 072119 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Closed-cell spray polyurethane foam.
- B. Related Requirements:
  - 1. Section 072100 "Thermal Insulation" for foam-plastic board insulation.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

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PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 2.0 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. BASF Corporation; SPF.
    - b. CertainTeed Corporation.
    - c. Dow Chemical Company (The).
    - d. Gaco Western LLC.
    - e. Henry Company.
    - f. Icynene Inc.
    - g. Johns Manville; a Berkshire Hathaway company.
    - h. NCFI Polyurethanes; a division of Barnhardt Manufacturing Company.
    - i. SWD Urethane Company.
    - j. Volatile Free, Inc.
  - 2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 75 or less.
    - b. Smoke-Developed Index: 450 or less.

2.2 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.

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- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.
- E. Cavity Walls: Install into cavities to thickness indicated on Drawings.
- F. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

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SECTION 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Self-adhering, vapor-retarding, air barrier.

1. Modified bituminous sheet.

1.2 DEFINITIONS

- A. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- B. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.
- C. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: Self-adhering, vapor-retarding, sheet air barrier. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.
1. Modified bituminous sheet.
- C. Shop Drawings: For air-barrier assemblies.
1. Show locations and extent of air barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

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1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.
- C. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.
- D. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- E. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
  - 1. Installer to be licensed by ABAA in accordance with ABAA's Quality Assurance Program and to employ ABAA-certified installers and supervisors on Project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
  - 1. Protect substrates from environmental conditions that affect air-barrier performance.
  - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

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## 2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction to be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested in accordance with ASTM E2357.

## 2.3 SELF-ADHERING SHEET AIR BARRIER

- A. Modified Bituminous Sheet: 40-mil-thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil-thick, cross-laminated polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Carlisle Coatings & Waterproofing Inc.
    - b. GCP Applied Technologies Inc.
    - c. Henry, a Carlisle Company (formerly Henry Company and Carlisle Coatings & Waterproofing Inc. brands).
    - d. Polyguard Products, Inc.
    - e. Rubber Polymer Corporation, Inc.
    - f. Soprema, Inc.
    - g. Tremco Incorporated.
    - h. W. R. Meadows, Inc.
  - 2. Physical and Performance Properties:
    - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E2178.
    - b. Tensile Strength: Minimum 250 psi; ASTM D412, Die C.
    - c. Ultimate Elongation: Minimum 200 percent; ASTM D412, Die C.
    - d. Puncture Resistance: Minimum 40 lbf; ASTM E154/E154M.
    - e. Water Absorption: Maximum 0.15 percent weight gain after 48-hour immersion at 70 deg F; ASTM D570.
    - f. Vapor Permeance: Maximum 0.1 perm; ASTM E96/E96M, Desiccant Method.
    - g. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested in accordance with ASTM D4541 as modified by ABAA.
    - h. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
    - i. UV Resistance: Can be exposed to sunlight for 60 days in accordance with manufacturer's written instructions.

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## 2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, 0.0187 inch thick, and Series 300 stainless steel fasteners.
- D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. GE Construction Sealants; Momentive Performance Materials Inc.
    - b. Pecora Corporation.
    - c. The Dow Chemical Company.
    - d. Tremco Incorporated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
  - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
  - 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
  - 3. Verify that substrates are visibly dry and free of moisture.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

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- C. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- D. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- E. Bridge isolation joints, expansion joints, and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement in accordance with manufacturer's written instructions and details.

### 3.3 INSTALLATION OF SELF-ADHERING SHEET AIR BARRIER

- A. Install materials in accordance with air-barrier manufacturer's written instructions and details and in accordance with recommendations in ASTM D6135 to form a seal with adjacent construction and ensure continuity of air and water barrier.
  - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.
  - 2. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
- B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic and in accordance with ASTM D6135.
- C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.
- D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch-minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
  - 1. Apply sheets in a shingled manner to shed water.
  - 2. Roll sheets firmly to enhance adhesion to substrate.
- E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.
- F. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch-wide, transition strip.
- G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- H. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
  - 1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.



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2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
- I. Connect and seal exterior wall air-barrier sheet continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- J. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.
- K. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- L. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip or preformed silicone extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
  1. Transition Strip: Roll firmly to enhance adhesion.
  2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- M. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- N. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.
- O. Do not cover air barrier until it has been tested and inspected by testing agency.
- P. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

### 3.4 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
  1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
  2. Continuous structural support of air-barrier system has been provided.
  3. Site conditions for application temperature and dryness of substrates have been maintained.

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4. Maximum exposure time of materials to UV deterioration has not been exceeded.
5. Surfaces have been primed.
6. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
7. Termination mastic has been applied on cut edges.
8. Air barrier has been firmly adhered to substrate.
9. Compatible materials have been used.
10. Transitions at changes in direction and structural support at gaps have been provided.
11. Connections between assemblies (air barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
12. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate in accordance with ASTM E2357.
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate in accordance with ASTM D4541 for each 600 sq. ft. of installed air barrier or part thereof.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, in accordance with manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

### 3.5 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, in accordance with manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials in accordance with air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

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SECTION 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal composite material (MCM) panels.

1.2 DEFINITIONS

- A. MCM: Metal composite material; cladding material formed by joining two thin metal skins to polyethylene or fire-retardant core and bonded under precise temperature, pressure, and tension.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel, system, and accessory.
1. Metal composite material (MCM) panels.
- C. Shop Drawings:
1. Include fabrication and installation layouts of MCM system; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, accessories, and special details.
  2. Accessories: Include details of flashing, trim, and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.
- D. Samples for Initial Selection: For each type of MCM panel indicated, with factory-applied color finishes.
1. Size: Manufacturers' standard size.
  2. Include Samples of trim and accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Test and Evaluation Reports:

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1. Product Test Reports: For each MCM panel, for tests performed by manufacturer and witnessed by a qualified testing agency.
  - a. MCM Panel Manufacturer's Material Test Reports: Certified test reports showing compliance with specific performance or third-party listing documenting compliance in accordance with the IBC.
  - b. Fabricator's MCM System Test Reports: Certified test reports showing system compliance with specific performance or third-party listing documenting compliance in accordance with the IBC.

1) Dry or Wet Seal System: Tested to AAMA 501.1.

- C. Field Quality-Control Reports.
- D. Qualification Statements: For manufacturer and Installer.
- E. Delegated design engineer qualifications.
- F. Sample warranties.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For MCM panels.
- C. Warranty Documentation:
  1. Manufacturers' special warranties.
  2. Installer's special warranties.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 years' experience.
- B. Installer Qualifications: Entity that employs installers and supervisors who are trained and approved by MCM system manufacturer.

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1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, MCM panels, and other manufactured items so as not to be damaged or deformed. Package MCM panels for protection during transportation and handling.
- B. Unload, store, and erect MCM panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack MCM panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store MCM panels to ensure dryness, with positive slope for drainage of water. Do not store MCM panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on MCM panels during installation.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of MCM panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate MCM panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Panel Integrity Warranty: Manufacturer agrees to repair or replace components of MCM panels that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Panel Finish Warranty: Manufacturer agrees to repair finish or replace MCM panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested in accordance with ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

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- c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
- 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. MCM System Warranty: System manufacturer's standard form in which manufacturer agrees to repair or replace components of MCM systems that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: MCM systems to withstand the effects of the following loads, based on testing in accordance with ASTM E330/E330M:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Deflection Limits: For wind loads, no greater than 1/60 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested in accordance with ASTM E283/E283M at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- C. Water Penetration under Static Pressure: No water penetration when tested in accordance with ASTM E331 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- E. Fire Propagation Characteristics: MCM system passes NFPA 285 testing.

### 2.2 METAL COMPOSITE MATERIAL (MCM) WALL PANELS

- A. Metal Composite Material (MCM) Wall Panels: Provide MCM panels fabricated from two metal facings bonded to a solid, extruded thermoplastic core.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND PLUS; 3A Composites USA, Inc., or comparable product by one of the following:
    - a. Alcotex Inc.
    - b. Alfrex, LLC
    - c. ALPOLIC

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- d. Alucoil North America
  - e. Arconic Architectural Products, LLC
  - f. Fairview Architectural
  - g. Mitsubishi Chemical America
  - h. StacBond
  - i. VM Building Solutions USA
- 2. Core: FR.
  - 3. Panel Thickness: 0.157 inch.
  - 4. Bond Strength: 22.5 in-lb/in. when tested for bond integrity in accordance with ASTM D1781.
  - 5. Fire Performance: Flame-spread index less than 25 and smoke-developed index less than 450, in accordance with ASTM E84 or UL 723.

B. MCM Panel Materials:

- 1. Aluminum-Faced Panels : ASTM B209/B209M alloy as standard with manufacturer, temper as required to suit finish and forming operations with manufacturer's standard aluminum sheet facings.
  - a. Exterior Finish: Two-coat fluoropolymer.
    - 1) Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

- A. Metal Subframing and Furring: ASTM C955 cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of MCM system.
- B. System Accessories: Provide components required for a complete, weathertight wall system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of MCM panels unless otherwise indicated.
- C. Flashing and Trim: Provide flashing and trim formed from same material as MCM panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent MCM panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Use gasketed or approved coated fasteners between dissimilar metals.
  - 1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- E. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in MCM panels and remain weathertight; and as recommended in writing by MCM system manufacturer.

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2.4 FABRICATION

- A. Fabricate and finish MCM panels at the factory, by panel manufacturer's standard procedures and processes, as necessary to fulfill indicated panel performance requirements demonstrated by laboratory testing.
- B. Shop-fabricate MCM systems and accessories by fabricator's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with requirements of MCM panel manufacturer, of indicated system profiles, and with dimensional and structural requirements.
  - 1. Fabricate panels to dimensions indicated on Drawings based on an assumed design temperature of 70 deg F. Allow for ambient temperature range at time of fabrication.
  - 2. Formed MCM panel lines, breaks, and angles to be sharp and straight, with surfaces free from warp or buckle.
  - 3. Fabricate panels with sharply cut edges and no displacement of face sheet or protrusion of core.
  - 4. Fabricated Panel Tolerances: Shop-fabricate panels to sizes and joint configurations indicated on Drawings.
    - a. Width: Plus or minus 0.079 inch at 70 deg F.
    - b. Length: Plus or minus 0.079 inch at 70 deg F.
    - c. Squareness: Plus or minus 0.079 inch at 70 deg F.
  - 5. Attach routed-and-turned panel flanges to panel clips with manufacturer's standard fasteners.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
  - 1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  - 3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
  - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  - 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal manufacturer for application, but not less than thickness of metal being secured.



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2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: 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.
- C. Coil-Coated Metal Finish:
  - 1. PVDF Fluoropolymer: AAMA 2605, two-coat fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, MCM system supports, and other conditions affecting performance of the Work.
  - 1. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by MCM system manufacturer.
    - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and assemblies penetrating MCM system to verify actual locations of penetrations relative to seam locations of MCM panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF MCM SYSTEM

- A. General: Install MCM system in accordance with system manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor MCM system securely in place, with provisions for thermal and structural movement.
  - 1. Shim or otherwise plumb substrates receiving MCM system.
  - 2. Flash and seal MCM system at perimeter of all openings. Fasten with self-tapping screws.
  - 3. Install screw fasteners in predrilled holes.

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4. Locate and space fastenings in uniform vertical and horizontal alignment.
  5. Install flashing and trim as MCM system work proceeds.
  6. Align bottoms of MCM panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  7. Provide weathertight escutcheons for all items penetrating system.
  8. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by MCM system manufacturer.
  9. Attach MCM panels to supports at locations, spacings, and with fasteners recommended by manufacturer to meet listed performance requirements.
- B. Attachment Assembly, General: Install attachment assembly required to support MCM panels and to provide a complete weathertight wall system, including tracks, drainage channels, anchor channels, perimeter extrusions, and panel clips.
1. Install subframing, furring, and other panel support members and anchorages in accordance with ASTM C955.
  2. Install support system at locations, at spacings, and with fasteners recommended by MCM system manufacturer to meet listed performance requirements.
- C. Dry-Seal MCM System: Attach MCM panels by interlocking panel clips into channels in a sequential series.
1. Seal horizontal and vertical joints between adjacent MCM panels with manufacturer's standard gaskets.
- D. Install panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
- E. Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install accessory components required for a complete MCM system assembly including trim, copings, corners, seam covers, flashings, sealants and gaskets, fillers, closure strips, and similar items. Provide types indicated by MCM system manufacturer.
- F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install trim to fit substrates and to result in waterproof performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 ft. with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

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3.3 INSTALLATION TOLERANCES

- A. Shim and align MCM panels within installed tolerance of 1/4 inch in 20 ft., non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING

- A. Remove temporary protective coverings and strippable films as MCM panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, clean finished surfaces as recommended by MCM panel manufacturer. Maintain in a clean condition during construction.
- B. After installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

3.5 PROTECTION

- A. Replace MCM panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered polyvinyl chloride (PVC) roofing system.
2. Accessory roofing materials.
3. Vapor retarder.
4. Roof insulation.
5. Insulation accessories and cover board.
6. Walkways.
7. Substrate board.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 061600 "Sheathing" for wood-based, structural-use roof deck panels.
3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 077100 "Roof Specialties" for premanufactured copings and roof edge flashings.
5. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.

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5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

#### 1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
  1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.
- C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
  1. Layout and thickness of insulation.
  2. Base flashings and membrane terminations.
  3. Flashing details at penetrations.
  4. Tapered insulation thickness and slopes.
  5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
  6. Tie-in with air barrier.
- D. Samples for Verification: For the following products:
  1. Roof membrane and flashing, of color required.
  2. Walkway pads or rolls, of color required.
- E. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer and manufacturer.
- C. Manufacturer Certificates:

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1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
  - a. Submit evidence of compliance with performance requirements.
2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- D. Product Test Reports: For roof membrane and insulation, tests performed by independent qualified testing agency indicating compliance with specified requirements.
- E. Evaluation Reports: For components of roofing system, from ICC-ES.
- F. Field quality-control reports.
- G. Sample Warranties: For manufacturer's special warranties.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For roofing system to include in maintenance manuals.
- C. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

#### 1.7 QUALITY ASSURANCE

- A. Qualifications:
  1. Manufacturers: A qualified manufacturer that is UL listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.
  2. Installers: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

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1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

#### 1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
  1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
  2. Warranty Period: 30 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, and walkway products for the following warranty period:
  1. Warranty Period: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings to remain watertight.
  1. Accelerated Weathering: Roof membrane to withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
  2. Impact Resistance: Roof membrane to resist impact damage when tested according to ASTM D3746, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

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- B. Material Compatibility: Roofing materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:
  - 1. As indicated on Structural Sheet S-001.
- D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and are listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
  - 1. Fire/Windstorm Classification: Class 1A-105.
  - 2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 SH.
- E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- F. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

## 2.2 POLYVINYL CHLORIDE (PVC) ROOFING

- A. PVC Keytone Ethylene Ester (KEE) Sheet: ASTM D4434/D4434M, Type III.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Carlisle Syntec Systems.
    - b. Flex Membrane International Corp.
    - c. GAF.
    - d. Sika Sarnafil Corp.
  - 2. Membrane Thickness: 80 mils.
  - 3. Exposed Face Color: White.
- B. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

## 2.3 ACCESSORY ROOFING MATERIALS

- A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.



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- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Roof Vents: As recommended by roof membrane manufacturer.
  - 1. Size: Not less than 4-inch diameter.
- E. Bonding Adhesive: Manufacturer's standard, water based.
- F. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors. Fasteners shall be stainless steel.
- G. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
- H. Ballast Retaining Bar: Perimeter securement system consisting of a slotted extruded-aluminum retention bar with an integrated compression fastening strip.
  - 1. Fasteners: 1-1/2-inch stainless steel fasteners with neoprene washers.
- I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

#### 2.4 SUBSTRATE BOARD

- A. Glass-Mat Gypsum Roof Substrate Board: ASTM C1177, water-resistant gypsum board. Thickness: 1/2-inch, factory primed.

#### 2.5 VAPOR RETARDER

- A. Rubberized-Asphalt-Sheet Vapor Retarder, Self-Adhering: ASTM D1970/D1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer/adhesive recommended by vapor retarder manufacturer.
- B. Field Quality Control:
  - 1. Testing Agency: Engage a qualified testing agency to perform tests, and to furnish reports to the Architect.
  - 2. Conduct adhesion tests of the specified vapor retarder to all substrate(s) at a rate of one test per 2,000 sq. ft. Submit test results to the Architect and the vapor retarder manufacturer, and notify both parties immediately of any test result that fails to meet the

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manufacturer's required adhesion. Do not proceed with vapor retarder installation until all deficiencies have been corrected. Perform the following tests:

- a. Tab Pull Test: Cut the membrane to form a 2-inch wide and 4-inch wide long tab, peel the membrane with a duckbill clamp or similar tool and a force gauge, and qualitatively evaluate the membrane adhesion, assessing if it is aggressively bonded to the substrate.
- b. Cross Cut Test: Cut the membrane two times in the shape of an "X." Each cut shall be 12 inches long. Peel the membrane with a duckbill clamp or similar tool and a force gauge, and qualitatively evaluate the membrane adhesion, assessing if it is aggressively bonded to the substrate.
- c. Adequate adhesion shall be demonstrated if the membrane meets the manufacturer's published ASTM D903 peel adhesion specification.
  - 1) In the event of adhesion failure, additional substrate preparation may be required. Repeat testing to verify suitability of substrate preparation.
  - 2) The Contractor is responsible for repairing any areas of the vapor retarder membrane where tests are conducted.
  - 3) The Architect shall provide final approval whether acceptable adhesion strength has been achieved.

## 2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by PVC roof membrane manufacturer, approved for use in FM Approvals' RoofNav listed roof assemblies.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Atlas Polyiso Roof and Wall Insulation.
    - b. Carlisle Syntec Systems.
    - c. Certainteed; SAINT-GOBAIN.
    - d. Dyplast Products.
    - e. Firestone Building Products.
    - f. GAF.
    - g. Hunter Panels.
    - h. Insulfoam; Carlisle Construction Materials Company.
    - i. Johns Manville; a Berkshire Hathaway company.
    - j. Polyglass U.S.A., Inc.
    - k. Rmax - A Business Unit of the Sika Corporation.
  2. Compressive Strength: 24 psi.
  3. Size: 48 by 48 inches.
  4. Thickness:
    - a. Base Layer: 2.6 inches.

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- b. Upper Layer: 2.6 inches.
- C. Tapered Insulation: Provide factory-tapered insulation boards.
  - 1. Material: Match roof insulation.
  - 2. Minimum Thickness: 1/4 inch.
  - 3. Slope: As indicated on Drawings.
    - a. Roof Field: As indicated on Drawings.
    - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

## 2.7 INSULATION ACCESSORIES AND COVER BOARD

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
  - 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
- C. Glass-Mat Gypsum Cover Board: ASTM C1177/C1177M, water-resistant gypsum board.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Certainteed; SAINT-GOBAIN.
    - b. Georgia-Pacific Gypsum LLC.
    - c. National Gypsum Company.
    - d. USG Corporation.
  - 2. Thickness: 1/2 inch.
  - 3. Surface Finish: Fiberglass facer.

## 2.8 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
  - 1. Size: Approximately 36 by 60 inches.
  - 2. Color: Contrasting with roof membrane.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
  - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
  - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
  - 3. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
    - a. Test Frequency: One test probe per each 1000 sq. ft., or portion thereof, of roof deck, with no fewer than three test probes.
    - b. Submit test reports within 24 hours of performing tests.
  - 4. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections. Remove asphalt residue from concrete surfaces and provide ICRI Concrete Surface Profile (CSP) 2.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

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### 3.4 INSTALLATION OF SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
  - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
    - a. Locate end joints over crests of steel roof deck.
  - 2. Tightly butt substrate boards together.
  - 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  - 4. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification, SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity, and FM Global Property Loss Prevention Data Sheet 1-29.
  - 5. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

### 3.5 INSTALLATION OF VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: Prime substrate with primer/adhesive recommended by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively. Apply vapor retarder from low to high points, in a shingle fashion, so that laps shed water.
  - 1. Extend vertically up parapet walls, building setback walls, curbs, penetrations and projections to a minimum height equal to height of insulation and cover board.
  - 2. Seal laps by rolling.

### 3.6 INSTALLATION OF INSULATION

- A. Installation Over Metal Decking:
  - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows, end joints staggered not less than 12 inches in adjacent rows, and with long joints continuous at right angle to flutes of decking.
    - a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    - b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
    - c. At internal roof drains, slope insulation to create a square drain sump.
      - 1) Trim insulation so that water flow is unrestricted.
    - d. Fill gaps exceeding 1/4 inch with insulation.

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- e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
  - 1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification and SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
  - 2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
- 2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
  - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
  - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
  - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
  - e. At internal roof drains, slope insulation to create a square drain sump.
  - f. Trim insulation so that water flow is unrestricted.
  - g. Fill gaps exceeding 1/4 inch with insulation.
  - h. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
  - i. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29.

B. Installation Over Concrete Decks:

- 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
  - a. Make joints between adjacent insulation boards not more than 1/4 inch in width.
  - b. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
    - 1) Trim insulation so that water flow is unrestricted.
  - c. Fill gaps exceeding 1/4 inch with insulation.
  - d. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
  - e. Adhere base layer of insulation to vapor retarder according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
    - 1) Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
    - 2) Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

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2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
  - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
  - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
  - d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
    - 1) Trim insulation so that water flow is unrestricted.
  - e. Fill gaps exceeding 1/4 inch with insulation.
  - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
  - g. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
    - 1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

### 3.7 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
  1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  2. At internal roof drains, conform to slope of drain sump.
    - a. Trim cover board so that water flow is unrestricted.
  3. Cut and fit cover board tight to nailers, projections, and penetrations.
  4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
    - a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
- B. Install cover board and immediately beneath roof membrane.

### 3.8 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

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- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.
- G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- H. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- I. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
  - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
  - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

### 3.9 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.



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### 3.10 INSTALLATION OF WALKWAYS

- A. Flexible Walkways: Install walkway products according to manufacturer's written instructions.
  - 1. Install flexible walkways at the following locations:
    - a. Perimeter of each rooftop unit.
    - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
    - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
    - d. Top and bottom of each roof access ladder.
    - e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
    - f. Locations indicated on Drawings.
  - 2. Provide 6-inch clearance between adjoining pads.
  - 3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Destructive Seam Testing: Destructive testing of heat-welded seams in the finished roofing installation. Test cuts shall be taken daily at the beginning of the day and every time there is an interruption in the welding process (i.e., power failure, welder shutdown, job conditions change, and after morning or lunch break). Test cuts shall include both seams constructed with an automatic welder and seams constructed by hand.
- C. Perform the following tests:
  - 1. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
    - a. Perform tests before overlying construction is placed.
    - b. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
    - c. Flood each area for 48 hours.
    - d. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.
      - 1) Cost of retesting is Contractor's responsibility.

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- e. Testing agency to prepare survey report indicating locations of initial leaks, if any, and final survey report.
- D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- E. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

### 3.12 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

### 3.13 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS \_\_\_\_\_ of \_\_\_\_\_, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
  - 1. Owner: **<Insert name of Owner>**.
  - 2. Owner Address: **<Insert address>**.
  - 3. Building Name/Type: **<Insert information>**.
  - 4. Building Address: **<Insert address>**.
  - 5. Area of Work: **<Insert information>**.
  - 6. Acceptance Date: \_\_\_\_\_.
  - 7. Warranty Period: **<Insert time>**.
  - 8. Expiration Date: \_\_\_\_\_.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are

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necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
  - a. lightning;
  - b. peak gust wind speed exceeding 72 mph;
  - c. fire;
  - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
  - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
  - f. vapor condensation on bottom of roofing; and
  - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

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E. IN WITNESS THEREOF, this instrument has been duly executed this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

1. Authorized Signature: \_\_\_\_\_.
2. Name: \_\_\_\_\_.
3. Title: \_\_\_\_\_.

END OF SECTION

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SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof-drainage sheet metal fabrications.
2. Low-slope roof sheet metal fabrications.
3. Wall sheet metal fabrications.
4. Miscellaneous sheet metal fabrications.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 072900 "Joint Sealants" for sealant.
3. Section 077100 "Roof Specialties" for manufactured copings and roof-edge specialties.

1.2 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each of the following

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1. Sheet flashing.

C. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, radii, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

D. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For fabricator.

## 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

## 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

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- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
  - 1. Build mockup of typical roof coping flashing, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
  - 1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
  - 2. Protect stored sheet metal flashing and trim from contact with water.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

## 1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.

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- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 SHEET METALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.
  - 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. Revere Copper Products, Inc.
    - b. Hussey Copper Ltd.
  - 2. Source Limitations: Obtain sheet from single source from single manufacturer.
- C. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
  - 1. Surface: Smooth, flat.
  - 2. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions for seacoast and severe environments.
  - 3. Color: As selected by Architect from manufacturer's full range.
  - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consist of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.



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## 2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
    - b. GCP Applied Technologies Inc.
    - c. Henry Company.
    - d. Owens Corning.
  - 2. Source Limitations: Obtain underlayment from single source from single manufacturer.
  - 3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.
  - 4. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

## 2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
    - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

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2. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:
1. For Copper: ASTM B32, Grade SN50, 50 percent tin and 50 percent lead.
- D. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal and finish as reglet.
1. Source Limitations: Obtain reglets from single source from single manufacturer.
  2. Material: Copper, 16 oz./sq. ft or Aluminum-Zinc Alloy-Coated Steel as noted on drawings.
  3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
  4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
  5. Accessories:
    - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
    - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
- E. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/20-inch-wide and 1/8-inch-thick.
- F. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

## 2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  2. Fabricate sheet metal flashing and trim in thickness or weight specified for each application and metal.
  3. Verify shapes, radii, and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.

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4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Non-Expansion-Type Joints: Fully soldered.

E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

H. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

I. Do not use graphite pencils to mark metal surfaces.

## 2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch-wide wall flanges to interior. Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch thick.

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2.7 DOWNSPOUTS

- A. Fabricate round downspouts to dimensions indicated, complete with mitered elbow. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
  - 1. Fabricated Hanger Style: Fig 1-35I according to SMACNA's "Architectural Sheet Metal Manual."
  - 2. Fabricate from the following materials:
    - a. Aluminum-Zinc Alloy Coated-Steel: 0.022 inch thick.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof-to-Wall Transition Expansion-Joint Cover: Fabricate from the following materials: Shop fabricate interior and exterior corners:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch thick.
- B. Base Flashing: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- C. Counterflashing, Flashing Inserts, Flashing Cleats: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
- D. Flashing Receivers: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
- E. Roof-Penetration Flashing: Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.9 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, at base of wall, and at shelf angles. Provide shop fabricated radius as required. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:
  - 1. Stainless Steel: 0.0156 inch thick.
- B. Opening Flashings in Frame Construction: Fabricated head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch high, end dams. Fabricate from the following materials:
  - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
  - 1. Verify compliance with requirements for installation tolerances of substrates.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering, High-Temperature Sheet Underlayment:
  - 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
  - 2. Prime substrate if recommended by underlayment manufacturer.
  - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
  - 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
  - 5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
  - 6. Roll laps and edges with roller.
  - 7. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
  - 1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder.
  - 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
  - 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
  - 6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.

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7. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
  2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
  2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Rivets: Rivet joints where necessary for strength.
- H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
  2. Do not pretin zinc-tin alloy-coated copper.
  3. Heat surfaces to receive solder, and flow solder into joint.
    - a. Fill joint completely.
    - b. Completely remove flux and spatter from exposed surfaces.
  4. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

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### 3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Parapet Scuppers:
  - 1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
  - 2. Anchor scupper closure trim flange to exterior wall and solder to scupper.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
  - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
  - 2. Connect downspouts to downspout boots and underground drainage system.

### 3.5 INSTALLATION OF ROOF FLASHINGS

- A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.
  - 1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
  - 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
  - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
  - 2. Extend counterflashing 4 inches over base flashing.
  - 3. Lap counterflashing joints minimum of 4 inches.
  - 4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

### 3.6 INSTALLATION OF WALL FLASHINGS

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

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3.7 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.9 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION



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SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Manufactured units for the following applications:
  - 1. Roof-edge specialties.
- B. Related Requirements:
  - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
  - 2. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of roof specialty.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: For roof specialties.
  - 1. Plans, expansion-joint locations, keyed details, and attachments to other work. Distinguish between factory pre manufactured- and field-assembled installation.
  - 2. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
  - 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
  - 4. Details of termination points and assemblies, including fixed points.
  - 5. Details of special conditions.
- D. Samples: For each type of roof specialty and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Certificates: For each type of roof specialty roof-edge flashings that is ANSI/SPRI/FM 4435/ES-1 tested.

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- C. Product Test Reports: For roof-edge flashings, for tests performed by a qualified testing agency.
- D. Research Reports: For roof-edge flashings, from an agency acceptable to authorities having jurisdiction or ICC-ES showing compliance with ANSI/SPRI/FM 4435/ES-1.
- E. Qualification Statements: For manufacturer.
- F. Sample warranties.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For roof specialties.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products that are ANSI/SPRI/FM 4435/ES-1 tested to specified design pressure.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.
  - 1. Build mockup of typical roof edge as shown on Drawings.
  - 2. Build mockup of typical roof edge, including fascia, approximately 10 feet long, including supporting construction, seams, attachments, underlayment, and accessories.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

#### 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

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## 1.8 COORDINATION

- A. Coordinate roof specialties with roofing system, exterior wall system, flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, weathertight, secure, and noncorrosive installation.
  - 1. Performance Coordination: Coordinate with the Work of roofing and exterior wall Sections to ensure that roof specialties provided under the Work of this Section meet or exceed specified roofing and exterior wall design performance requirements.
- B. Confirm and coordinate compatibility of materials and comply with warranty requirements of roofing system manufacturer.
- C. Coordinate roof specialties layout and seams with sizes and locations of joints and seams in adjacent materials.

## 1.9 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 075419 "Polyvinyl-Chloride (PVC) Roofing."
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finishes or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain roof specialties from single manufacturer providing roofing-system warranty specified in Section 075419 "Polyvinyl-Chloride (PVC) Roofing."

### 2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

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- B. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.3 ROOF-EDGE SPECIALTIES

- A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 ft. and a continuous metal receiver with integral drip-edge cleat to engage fascia cover and secure single-ply roof membrane. Provide matching corner units.

1. Basis-of-Design Product: Subject to compliance with requirements, provide "TerminEdge EX" OMG Roofing Products, or comparable product by one of the following:

- a. ATAS International, Inc.
- b. Metal-Era, Inc.
- c. PAC-CLAD; Pedersen Aluminum Corporation; a Carlisle Company.

2. Formed Aluminum Fascia Covers: Aluminum sheet, 0.050 inch thick.

- a. Surface: Smooth, flat finish.
- b. Finish: Two-coat fluoropolymer.
- c. Color: As selected by Architect from manufacturer's full range to match existing.

3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
5. Receiver: Manufacturer's standard material and thickness.
6. Special Fabrications: Radius units.

## 2.4 SHEET METAL MATERIALS

- A. Aluminum Sheet: ASTM B209/B209M, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

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- a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight in color coat.
- 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- B. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise, mill finished.

## 2.5 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Roof specialty manufacturer's recommended fasteners, designed to meet performance requirements, suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
  - 1. Fasteners for Metallic-Coated Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
  - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- D. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- F. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install roof specialties in accordance with manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
  - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
  - 2. Provide uniform, neat seams with minimum exposure of sealant.
  - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
  - 4. Torch cutting of roof specialties is not permitted.
  - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer's written installation instructions.
  - 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
  - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
  - 1. Space movement joints at a maximum of 12 ft. with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
  - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended in writing by fastener manufacturer to achieve maximum pull-out resistance.

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- E. Seal concealed joints with butyl sealant as required by roof specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 INSTALLATION OF ROOF-EDGE SPECIALTIES

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- B. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

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SECTION 078100 - APPLIED FIREPROOFING

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 sprayed fire-resistive materials.
- B. Related Requirements:
  - 1. Section 051200 "Structural Steel Framing" for steel framing.
  - 2. Section 052100 "Steel Joist Framing" for open web steel joists and joist girders.
  - 3. Section 053100 "Steel Decking" for steel floor and roof decking.
  - 4. Section 078123 "Intumescent Fireproofing" for mastic and intumescent fire-resistive coatings.

1.3 DEFINITIONS

- A. SFRM: Sprayed fire-resistive materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.5 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Shop Drawings: Framing plans or schedules, or both, indicating the following:
  - 1. Extent of fireproofing for each construction and fire-resistance rating.



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- a. Fire resistance design thickness for open web steel joists shall be based on testing at a maximum allowable stress of 30 ksi matching SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."
- 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
- 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
- 4. Treatment of fireproofing after application.
- D. Samples: For each exposed product and for each color and texture specified, 4 inches square in size.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer and testing agency.
- C. Product Certificates: For each type of fireproofing.
- D. Evaluation Reports: For fireproofing, from ICC-ES.
- E. Preconstruction Test Reports: For fireproofing.
- F. Field quality-control reports.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

#### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
  - 2. Fire-resistance design thickness for open web steel joists shall be based on testing at a maximum allowable stress of 30 ksi.
- D. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Carbolite Company; a subsidiary of RPM International.
    - b. GCP Applied Technologies Inc. (formerly Grace Construction Products).
    - c. Isolatek International.
    - d. Schundler Company (The).
    - e. Southwest Fireproofing Products Co.
  - 2. Bond Strength: Minimum 150-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.
  - 3. Density: Not less than density specified in the approved fire-resistance design, according to ASTM E 605.
  - 4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.
  - 5. Combustion Characteristics: ASTM E 136.
  - 6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 10 or less.

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b. Smoke-Developed Index: 10 or less.

7. Compressive Strength: Minimum 10 lbf/sq. in. according to ASTM E 761.
8. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
9. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
11. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.
12. Finish: As selected by Architect from manufacturer's standard finishes.

## 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
  1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
  2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written instructions. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.
- H. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
  - 1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, encapsulants, and rust, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
  - 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
  - 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Verify that concrete work on steel deck is complete before beginning fireproofing work.
- C. Verify that roof construction, installation of rooftop HVAC equipment, and other related work are complete before beginning fireproofing work.
- D. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

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### 3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
  - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
  - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Metal Decks:
  - 1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, is completed.
  - 2. Do not apply fireproofing to underside of metal roof deck until roofing is completed; prohibit roof traffic during application and drying of fireproofing.
- E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- F. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- G. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.
- J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
- K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- L. Cure fireproofing according to fireproofing manufacturer's written instructions.

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- M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- N. Finishes: Where indicated, apply fireproofing to produce the following finishes:
  - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. Test and inspect as required by the 2015 International Building Code (IBC), Subsection 1704.12, "Sprayed Fire-Resistant Materials."
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
  - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
  - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

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SECTION 078123 - INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes mastic and intumescent fire-resistive coatings.
- B. Related Requirements:
  - 1. Section 051200 "Structural Steel Framing" for steel framing.
  - 2. Section 052100 "Steel Joist Framing" for open web steel joists and joist girders.
  - 3. Section 053100 "Steel Decking" for steel floor and roof decking.
  - 4. Section 078100 "Applied Fireproofing" for sprayed fire-resistive materials (SFRM).

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Shop Drawings: Framing plans or schedules, or both, indicating the following:
  - 1. Extent of fireproofing for each construction and fire-resistance rating.
  - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
  - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
  - 4. Treatment of fireproofing after application.
- D. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

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1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Build mockup of each type of fireproofing and different substrate and each required finish as shown on Drawings.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.



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- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- 1. Steel members are to be considered unrestrained unless specifically noted otherwise.

- D. Asbestos: Provide products containing no detectable asbestos.

## 2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Mastic and Intumescent Fire-Resistive Coating: Isolatek International CAFCO Spray Film WB 5 or equal, factory-mixed formulation, and complying with indicated fire-resistance design.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Albi Manufacturing; a division of StanChem, Inc.
    - b. Carboline Company; a subsidiary of RPM International.
    - c. Hilti, Inc.
    - d. International Protective Coatings.
    - e. Isolatek International.

- 2. Application: Designated for "conditioned interior space purpose" use by a qualified testing agency acceptable to authorities having jurisdiction. Product must be capable of being applied at more than 1 coat per day at minimum 25 mils per coat to reach final applied film thickness.
  - 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
  - 4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 50 or less.
  - 5. Finish: Rolled, spray-textured finish.
  - 6. VOC: Product must be zero VOC.

## 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

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- C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- E. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
  - 1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, encapsulants, and rust, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
  - 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
  - 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

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- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

### 3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
  - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
  - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- E. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- I. Cure fireproofing according to fireproofing manufacturer's written instructions.
- J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- K. Finishes: Where indicated, apply fireproofing to produce the following finishes:

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1. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

### 3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
  1. Test and inspect as required by the 2015 International Building Code (IBC), Subsection 1704.13, "Mastic and Intumescent Fire-Resistant Coatings."
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
  1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
  2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

### 3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

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SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetration firestopping systems.
2. Penetrations in fire-resistance-rated walls.
3. Penetrations in horizontal assemblies.
4. Penetrations in smoke partitions.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.
2. Section 079200 "Joint Sealants" for non-fire-resistance-rated joint sealants.
3. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site. Minimally, the Contractor, the firestopping testing agency, and the firestopping installer shall attend this meeting.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
  1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly developed in accordance with current International Firestop Council (IFC) guidelines. Obtain approval of authorities having jurisdiction prior to submittal.

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- D. Test and inspections report by qualified testing agency.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer. Provide documentation of training and experience.
- C. Listed System Designs: For each penetration firestopping system, for tests performed by a qualified testing agency.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.
- C. Inspection Reports: Include with the inspection report a summary table identifying the quantity and percentage of penetrations and voids of each system inspected, indicating compliance with ASTM E2393 and ASTM E2174. Submit inspection report stating that firestopping and smoke sealing work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.
- D. As-Built update of product schedule.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Entity that has been approved by FM Approvals in accordance with FM Approvals 4991 or been evaluated by UL and found to comply with UL's "UL Solutions Qualified Firestop Contractor Program."
  - 2. Firestopping subcontractor/installer shall be in the business of installing firestopping and related work only. Firestopping Contractor shall be certified/licensed by the firestopping manufacturer as having the necessary staff, training, and a minimum of 5 years' experience in the installation of manufacturer's products in accordance with specified requirements. Submit documentation of this experience.
- B. The firestopping shall not be installed by any other subcontractors such as the electrical contractor, mechanical contractor, etc. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. The installer shall obtain from the manufacturer and submit written certification of training and retain proof of certification for duration of firestop installation.
- C. One firestopping subcontractor/installer shall perform all firestopping and/or smoke sealing throughout the project.

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- D. Obtain penetration firestopping systems, for each type of penetration and construction condition, from a single manufacturer.
- E. Inspector Qualifications: The inspector shall be acceptable to the Authority Having Jurisdiction and shall meet the criteria contained in ASTM E699 for agencies involved in quality assurance and shall have a minimum of ten years experience in construction field inspections of firestopping systems, products, and assemblies. The inspector shall be completely independent of, and divested from, the installer, the manufacturer, and the supplier of any material or item being inspected. The inspector shall not be a competitor of the installer, the contractor, the manufacturer, or supplier of any material or item being inspected.

## 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping systems when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping system materials in accordance with manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

## 1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be accessed and installed in accordance with specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.
- C. Coordinate material, diameter, and length of sleeves, if used, with other trades and with firestopping and/or smoke sealing assemblies selected.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain penetration firestopping systems for each type of opening indicated from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. A qualified testing agency, acceptable to authorities having jurisdiction, will perform penetration firestopping system tests.
  - 2. Test in accordance with testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

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- a. Penetration firestopping systems installed with products bearing the classification marking of a qualified testing agency.
  - 1) UL in its online directory "Product iQ."
  - 2) Intertek Group in its "Directory of Building Products."
  - 3) FM Approvals in its "Approval Guide."
- B. Provide components for each penetration firestopping system that, upon curing, do not re-emulsify, dissolve, leach, break down, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water, or other forms of moisture characteristic during and after construction.
- C. Provide components for each penetration firestopping system that are sufficiently flexible to accommodate movement, such as pipe vibration, water hammer, thermal expansion, and other normal building movement without damage.
- D. Provide components for each penetration firestopping system that are appropriately tested for the thickness and type of insulation utilized.

## 2.3 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems must be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations include both through-penetrations where the entire assembly is penetrated, and membrane penetrations where only a portion of the assembly is penetrated. Penetrations include, but are not limited to, the annular space around pipes, tubes, ductwork without a fire damper, conduit, wires, cables, vents, and structural members.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. 3M Building and Construction.
    - b. A/D Fire Protection Systems, Inc.
    - c. Grabber Construction Products, Inc.
    - d. Hilti, Inc.
    - e. Holdrite; a division of Reliance Worldwide Corporation.
    - f. Passive Fire Protection Partners.
    - g. Rectorseal.
    - h. Tremco Incorporated.
- C. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.
  1. F-Rating: Not less than the fire-resistance rating of the constructions penetrated.
  2. Membrane Penetrations: Install recessed fixtures such that the required fire resistance will not be reduced.



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- D. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.
  - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of the floor penetrated.
  - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of the floor. The following floor penetrations do not require a T-rating:
    - a. Those within the cavity of a wall.
    - b. Floor, tub, or shower drains within a concealed space.
    - c. 4-inch or smaller metal conduit penetrating directly into metal-enclosed electrical switchgear.
  - 3. W-Rating: Provide penetration firestopping systems with a Class 1 W-rating in accordance with UL 1479.
- E. Penetrations in Smoke Partitions: Penetration firestopping systems with ratings determined in accordance with UL 1479.
  - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- F. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E84 or UL 723.
  - 1. Sealant shall have a VOC content of 250 g/L or less.

## 2.4 ACCESSORIES

- A. Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated, including but not limited to:
  - 1. Permanent forming/damming/backing materials.
  - 2. Substrate primers.
  - 3. Collars.
  - 4. Steel sleeves.
  - 5. Wire mesh.
  - 6. Metal lath.

## 2.5 FILL MATERIALS

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Firestopping Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

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- D. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric strips for use around combustible penetrants.
- F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- G. Pillows/Bags: Compressible, removable, and reusable intumescent pillows encased in fire-retardant polyester or glass-fiber cloth. Where exposed, and when required by a listed system, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed or dislodged.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.
- J. Fire-Rated Cable Sleeve Kits: Complete kits designed for new or existing cable penetrations through walls which accept standard accessories.
- K. Fire-Rated Cable Pathways: Single or gangable device modules composed of a steel raceway with integral intumescent material and requiring no additional action in the form of plugs, twisting closure, putty, pillows, sealant, or otherwise to achieve fire and air-leakage ratings.
  - 1. Fire-rated cable pathway devices are the preferred product for data, video, and communications cable penetrations. Install these devices in locations where frequent cable moves, add-ons, and changes will occur. Such devices must be:
    - a. Capable of retrofit around existing cables.
    - b. Designed so that two or more devices can be ganged together.
    - c. Maintenance-free so no action is required to activate the smoke- and fire-sealing mechanism.
  - 2. Where fire-rated cable pathway devices are not practical, openings within walls and floors designed to accommodate data, video, and communications cabling must be provided with re-enterable products specifically designed for retrofit, such as retrofit devices for cable bundles, firestopping putty, plugs, or pillows.
- L. Retrofit Device for Cable Bundles: Factory-made, intumescent, collar-like device for firestopping existing over-filled cable sleeves and capable of being installed around projecting sleeves and cable bundles.
- M. Closet Flange Gasket: Molded, single-component, flexible, intumescent gasket for use beneath a water closet (toilet) flange in floor applications.

## 2.6 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate

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proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work. Verify penetrating items are rigidly supported on both sides unless otherwise permitted by the listed firestopping and/or smoke sealing system.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings in accordance with manufacturer's written instructions and with the following requirements:
  - 1. Remove foreign materials from substrate surfaces that could interfere with adhesion of penetration firestopping materials.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates in accordance with penetration firestopping system manufacturer's written installation instructions, using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

#### 3.3 INSTALLATION

- A. General: Install penetration firestopping systems in accordance with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items to achieve required fire-resistance ratings.

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2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Fire dampers are not to be provided with penetration firestopping or smoke sealing unless the use of firestopping or smoke sealant has been tested and approved as part of the fire damper system.

### 3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. from end of wall and at intervals not exceeding 30 ft..
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  2. Contractor's name, address, and phone number.
  3. Designation of applicable testing and inspecting agency.
  4. Date of installation.
  5. Manufacturer's name.
  6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified inspection agency to conduct and report on inspections in accordance with ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

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- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION

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SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Joints in or between fire-resistance-rated construction.
- 2. Joints in smoke barriers.

B. Related Requirements:

- 1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.
- 2. Section 079513.16 "Exterior Expansion Joint Cover Assemblies" for fire-resistive manufactured expansion-joint cover assemblies for exterior building walls, soffits, and parapets.
- 3. Section 092216 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

- 1. For each type of product.

- C. Unlisted Firestopping Systems: Obtain an Engineering Judgment (EJ) from firestop manufacturer where no UL, FM Approvals, or other listed assembly is available for particular firestop configuration. Follow International Firestop Council (IFC) recommended guidelines for evaluating firestop systems in EJs.

- D. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

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1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an EJ or equivalent fire-resistance-rated assembly developed in accordance with current IFC guidelines.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer.
- C. Listed System Designs: For each joint firestopping system, for tests performed by a qualified testing agency.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Installer Certificates: From Installer indicating that joint firestopping and/or smoke sealing systems have been installed in compliance with requirements and manufacturer's written instructions.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- D. Inspection Reports: Include with the inspection report a summary table identifying the lineal feet of each system inspected, indicating compliance with ASTM E2393 and ASTM E2174. Submit inspection report stating that firestopping and smoke sealing work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.
- E. As-built update of product schedule.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
  1. A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements"; or
  2. Firestopping subcontractor/installer shall be in the business of installing firestopping and related work only. Firestopping Contractor shall be certified/licensed by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years' experience in the installation of manufacturer's products in accordance with specified requirements. Submit documentation of this experience.

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- B. The firestopping and/or smoke sealing shall not be installed by any other subcontractors such as the electrical contractor, mechanical contractor, etc. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. The installer shall obtain from the manufacturer and submit written certification of training and retain proof of certification for duration of firestop installation.
- C. One firestopping subcontractor/installer shall perform all firestopping throughout the project.
- D. Obtain joint firestopping and/or smoke sealing systems, for each type of penetration and construction condition, from a single manufacturer.
- E. Inspector Qualifications: The inspector shall be acceptable to the Authority Having Jurisdiction and shall meet the criteria contained in ASTM E699 for agencies involved in quality assurance and shall have a minimum of ten years experience in construction field inspections of firestopping systems, products, and assemblies. The inspector shall be completely independent of, and divested from, the installer, the manufacturer, and the supplier of any material or item being inspected. The inspector shall not be a competitor of the installer, the contractor, the manufacturer, or supplier of any material or item being inspected.

## 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems in accordance with manufacturer's written installation instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

## 1.9 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed in accordance with specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. A qualified testing agency, acceptable to authorities having jurisdiction, will perform joint firestopping system tests.



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2. Test in accordance with testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
  - a. Joint firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.
    - 1) UL in its online directory "Product iQ."
    - 2) Intertek Group in its "Directory of Building Products."

### 2.3 JOINT FIRESTOPPING SYSTEM TYPES

- A. General: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems must accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
  1. Joint firestopping systems that are compatible with one another, with the substrates forming openings, and with penetrating items, if any.
  2. Provide products that, upon curing, do not re-emulsify, dissolve, leach, break down, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.
  3. Provide firestop products that do not contain ethylene glycol.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined in accordance with ASTM E1966 or UL 2079, with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the fire-resistive joint system to restrict the movement of smoke.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. 3M Building and Construction.
    - b. Everkem Diversified Products, Inc.
    - c. Grabber Construction Products, Inc.
    - d. Hilti, Inc.
    - e. Nelson; Emerson Electric Co., Automation Solutions.
    - f. Owens Corning.
    - g. Passive Fire Protection Partners.
    - h. RectorSeal Firestop; a CSW Industrials Company.
    - i. ROCKWOOL.
    - j. Specified Technologies Inc.
    - k. Tremco Incorporated.
  2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed. Where joints are between assemblies of two different fire resistance ratings, the joint shall have an hourly rating meeting or exceeding the highest fire resistance rating of the two assemblies.
  3. L-Rating: Not exceeding 5.0 cfm/ft of joint at both ambient and elevated temperatures.

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- C. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined in accordance with UL 2079 based on testing at a positive pressure differential of 0.30 inch wg.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. 3M Building and Construction.
    - b. Hilti, Inc.
    - c. Nelson; Emerson Electric Co., Automation Solutions.
    - d. Owens Corning.
    - e. Passive Fire Protection Partners.
    - f. RectorSeal Firestop; a CSW Industrials Company.
    - g. ROCKWOOL.
    - h. Specified Technologies Inc.
    - i. Tremco Incorporated.
  2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed. Where joints are between assemblies of two different fire resistance ratings, the joint shall have an hourly rating meeting or exceeding the highest fire resistance rating of the two assemblies.
  3. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- D. Joints in Smoke Partitions: Provide smoke-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. 3M Fire Protection Products.
    - b. A/D Fire Protection Systems Inc.
    - c. Hilti, Inc.
    - d. Nelson Firestop; a brand of Emerson Industrial Automation.
    - e. Passive Fire Protection Partners.
    - f. RectorSeal.
    - g. ROXUL.
    - h. Specified Technologies, Inc.
    - i. Thermafiber, Inc.; an Owens Corning company.
    - j. Tremco, Inc.
  2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.
  1. Sealant shall have a VOC content of 250 g/L or less.
  2. Verify sealant complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

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2.4 ACCESSORIES

- A. Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing joint firestopping systems, clean joints in accordance with fire-resistive joint system manufacturer's written installation instructions and the following requirements:
  - 1. Remove foreign materials from substrate surfaces that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
  - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates in accordance with joint firestopping system manufacturer's written installation instructions, using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Apply a suitable bond breaker to prevent three-sided adhesion in applications where condition occurs.

3.3 INSTALLATION

- A. General: Install joint firestopping systems in accordance with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

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- C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:
  - 1. Apply elastomeric fill in voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
  - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
  - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
  - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. from end of wall and at intervals not exceeding 30 ft..
- B. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge, so labels are visible to anyone seeking to remove joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Designation of applicable testing agency.
  - 4. Date of installation.
  - 5. Manufacturer's name.
  - 6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections in accordance with ASTM E2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

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- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

END OF SECTION

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SECTION 079100 - PREFORMED JOINT SEALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preformed, rubber expansion joint seals.
2. Interior expansion joint cover assemblies.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for liquid sealants applied over preformed seals in dual-seal systems.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Preformed, rubber expansion joint seals.

C. Samples for Initial Selection: Manufacturer's color sheets, showing full range of available colors for each type of exposed preformed rubber expansion joint seal.

D. Shop Drawings: For each expansion joint cover assembly.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

1.3 INFORMATIONAL SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Sample warranties.

1.4 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace preformed joint seals and interior expansion joint covers that fail in materials or workmanship within specified warranty period.

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1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish preformed rubber expansion joint seals and interior expansion joint covers to repair or replace those 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 SOURCE LIMITATIONS

- A. For preformed rubber expansion joint seals, obtain each color, type, and variety of joint seal from single source with resources to provide products of consistent quality in appearance and physical properties.

### 2.2 PREFORMED, FOAM JOINT SEALS

- A. Preformed, Rubber Expansion Foam Joint Seals: Manufacturer's standard joint seal manufactured from elastoprene rubber or comparable material in a multi-web seal profile. Factory produce in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory- or field-applied adhesive for bonding to substrates.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. EMSEAL; a Sika Company.
    - b. MM Systems Corporation.
    - c. Nystrom, Inc.
    - d. Pecora Corporation.
    - e. Willseal LLC, part of Tremco CPG.
  2. Design Criteria:
    - a. Nominal Joint Width: As indicated on Drawings.
    - b. Movement Capability: -25 percent/+25 percent.
  3. Joint Seal Color: As selected by Architect from full range of industry colors.

### 2.3 INTERIOR WALL EXPANSION JOINT COVERS

- A. Elastomeric-Seal Wall Joint Cover: Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide "VSS - Wall to Wall," MM Systems Corporation, or comparable product by one of the following:
    - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.

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- b. Balco, Inc.
  - c. Construction Specialties, Inc.
  - d. InPro Corporation (IPC).
  - e. Nystrom, Inc.
  - f. Watson Bowman Acme Corp.
- 2. Application: Wall to wall.
- 3. Exposed Metal:
  - a. Aluminum: Color anodic, Class I.
- 4. Seal: Preformed elastomeric membranes or extrusions.
  - a. Color: As selected by Architect from manufacturer's full range.

## 2.4 INTERIOR CEILING EXPANSION JOINT COVERS

- A. Elastomeric-Seal Ceiling Joint Cover: Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide "VSS – Ceiling," MM Systems Corporation, or comparable product by one of the following:
    - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
    - b. Balco, Inc.
    - c. Construction Specialties, Inc.
    - d. InPro Corporation (IPC).
    - e. Nystrom, Inc.
    - f. Watson Bowman Acme Corp.
  - 2. Application: Ceiling to wall.

## 2.5 MISCELLANEOUS MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
  - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Primer: Material recommended by preformed rubber expansion joint seal manufacturer for joint substrates indicated.
- C. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to preformed rubber expansion joint seal manufacturer, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces, and formulated to promote best adhesion to joint substrates.
- D. Masking Tape: Nonstaining, nonabsorbent material compatible with preformed rubber expansion joint seals and surfaces adjacent to joints.



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- E. Manufacturer's standard preformed rubber expansion joint seal adhesive.
- F. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.
- G. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.
- H. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.6 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

## 2.7 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
  - 1. Provide where indicated on Drawings.
- B. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive preformed rubber expansion joint seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting preformed joint seal performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing preformed rubber expansion joint seals to comply with preformed joint seal manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings tested and approved for seal adhesion and compatibility by seal manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

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2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimal bond with preformed joint seals. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Exterior insulation and finish systems.
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint seals. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended by preformed rubber expansion joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF PREFORMED, FOAM JOINT SEALS

- A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
1. Install each length of seal immediately after removing protective wrapping.
  2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.
  3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
  4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

### 3.4 INSTALLATION OF INTERIOR EXPANSION COVERS

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
1. Install frames in continuous contact with adjacent surfaces.

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- a. Shimming is not permitted.
- 2. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
- 3. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
- 4. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
- 5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
  - 1. Provide in continuous lengths for straight sections.
  - 2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
  - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

### 3.5 PROTECTION

- A. Protect preformed rubber expansion joint seals from damage resulting from construction operations or other causes so seals are without deterioration or damage at time of Substantial Completion.
- B. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- C. Cut out, remove, and repair damaged or deteriorated seals so repaired areas are indistinguishable from original work.

END OF SECTION

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SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonstaining silicone joint sealants.
2. Mildew-resistant joint sealants.
3. Latex joint sealants.

B. Related Requirements:

1. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Nonstaining silicone joint sealants.
2. Urethane joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

C. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Sample warranties.

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1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Manufacturers' special warranties.
- C. Installer's special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  - 2. Disintegration of joint substrates from causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

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PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. GE Construction Sealants; Momentive Performance Materials Inc.
    - b. Pecora Corporation.
    - c. Sika Corporation – Building Components.
    - d. The Dow Chemical Company.
    - e. Tremco Incorporated.

2.4 URETHANE JOINT SEALANTS

- A. Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C920, Type S or Type M, Grade NS, Class 25, for Use T.
- B. Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type S or Type M, Grade P, Class 25, for Use T.

2.5 MILDREW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. GE Construction Sealants; Momentive Performance Materials Inc.
  - b. Pecora Corporation.
  - c. Sika Corporation – Building Components.
  - d. Soudal USA.
  - e. The Dow Chemical Company.
  - f. Tremco Incorporated.

## 2.6 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Everkem Diversified Products, Inc.
  - b. Franklin International.
  - c. Pecora Corporation.
  - d. Sherwin-Williams Company (The).
  - e. Tremco Incorporated.

## 2.7 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

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. Alcot Plastics Ltd.
  - b. Construction Foam Products; a division of Nomaco, Inc.
  - c. Master Builders Solutions.

- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

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- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
    - d. Exterior insulation and finish systems.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.



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- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

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3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

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SECTION 079219 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Acoustical joint sealants.
- B. Related Requirements:
  - 1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants, showing full range of available colors for each product exposed to view.
- D. Acoustical Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Test and Evaluation Reports:
  - 1. Product Test Reports: For each type of acoustical joint sealant, for tests performed by qualified testing agency or manufacturer and witnessed by a qualified testing agency.
- C. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Warranty Documentation:

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1. Manufacturers' special warranties.
2. Installer's special warranties.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained between 40 and 95 deg F.
  1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste from storage areas daily.

## 1.6 WARRANTY

- A. Installer's Special Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. Warranty Period: Two years from date of Substantial Completion.
- B. Manufacturer's Special Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 ACOUSTICAL JOINT SEALANTS

- A. Acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies in accordance with ASTM E90.
- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Accumetric LLC; Boxx 826 Acoustifal Sound Sealant.
    - b. GE Construction Sealants; Momentive Performance Materials Inc.; RCS20 Acoustical.
    - c. Grabber Construction Products; Acoustical Sealant GSC.
    - d. OSI Sealants; Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant.
    - e. Pecora Corporation; AIS-919.
    - f. Serious Energy Inc.; Quiet Seal Pro.
    - g. Tremco Incorporated; Tremco Acoustical Sealant.
    - h. USG Corporation; SHEETROCK Acoustical Sealant.

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2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

## 2.2 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint

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sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written instructions for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

### 3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

### 3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

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SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standard steel doors and frames.
2. Interior ballistic steel doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
1. Interior standard steel doors and frames.
  2. Interior ballistic steel doors and frames.
- C. Product Data Submittals: For each product.
1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, ballistic resistance, and finishes.
- D. Shop Drawings: Include the following:
1. Elevations of each door type.
  2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.

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5. Details of each different wall opening condition.
  6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
  7. Details of anchorages, joints, field splices, and connections.
  8. Details of accessories.
  9. Details of moldings, removable stops, and glazing.
- E. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For door inspector.
1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
  2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
- C. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly and fire-rated borrowed-lite assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.
- D. Field quality-control reports.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

#### 1.7 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies is to meet the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies is to meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:



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1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 HOLLOW METAL DOORS AND FRAMES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ceco Door; AADG, Inc.; ASSA ABLOY.
  - 2. Curries, AADG, Inc.; ASSA ABLOY Group.
  - 3. Gensteel Doors.
  - 4. Mesker Door; Mesker Openings Group.
  - 5. Metropolitan Door Industries Corp.
  - 6. Republic Doors and Frames; a Allegion brand.
  - 7. Steelcraft; Allegion plc.
  - 8. Total Security Solutions.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
  - 1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.
- C. Ballistic Resistance: UL 752 Level 3.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

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B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.

1. Doors:
  - a. Type: As indicated in the Door and Frame Schedule on Drawings.
  - b. Thickness: 1-3/4 inches.
  - c. Face: Uncoated steel sheet, minimum thickness of 0.053 inch.
  - d. Edge Construction: Model 1, Full Flush.
  - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
  - f. Core: Manufacturer's standard.
  - g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener or laminated mineral board core for fire-rated doors.
2. Frames:
  - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
  - b. Sidelite: Fabricated from same thickness material as adjacent door frame.
  - c. Construction: Face welded.
3. Exposed Finish: Prime.

2.4 INTERIOR BALLISTIC RESISTANT HOLLOW METAL DOORS AND FRAMES

A. Ballistic Resistant Doors and Frames: ANSI/SDI A250.8, Level 4; ANSI/SDI A250.4, Level A.

1. Doors:
  - a. Type: As indicated in the Door and Frame Schedule on Drawings.
  - b. Thickness: 1-3/4 inches.
  - c. Face: Uncoated steel sheet, minimum thickness of 0.067 inch.
  - d. Edge Construction: Model 1, Full Flush.
  - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
  - f. Core: Manufacturer's standard ballistic resistant (UL 752 Level 3) core.
  - g. Fire-Rated Core: Manufacturer's standard fire and ballistic (UL 752 Level 3) core for fire-rated ballistic resistant doors.
2. Frames:
  - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
  - b. Armor Plating: Manufacturer's standard armor plating for UL 752 Level 3 frame.
  - c. Construction: Face welded.
3. Exposed Finish: Prime.

2.5 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch and as required for ballistic resistance UL 752 Level 3.
- B. Construction: Face welded.

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- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

## 2.6 INTERIOR BALLISTIC RESISTANT AND FIRE RATED BORROWED LITES

- A. Ballistic Resistant and Fire Rated Borrowed Lite Frames:
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide "FireFrames Heat Barrier Series-Bullet Resistant"; Technical Glass Products, or a comparable product.
  - 2. Frames:
    - a. Fire Performance: NFPA 80 and UL 263.
      - 1) Fire Resistance (Walls and Windows): 120 minutes.
    - b. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
    - c. Armor Plating: Manufacturer's standard armor plating for UL 752 Level 3 frame.
    - d. Accessories: Manufacturer's recommended insulation and intumescent system for fire rating indicated.
    - e. Construction: Face welded.
  - 3. Exposed Finish: Prime.

## 2.7 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
  - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
  - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

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## 2.8 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.
- D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- E. Glazing: Comply with requirements in Sections 088000 "Glazing" and 088853 "Security Glazing."

## 2.9 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
  - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.
  - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.

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4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

## 2.10 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.
  1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
    - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    - b. Install frames with removable stops located on secure side of opening.
  2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
  3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
  4. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

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- c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
  - 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
  - 2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
  - 3. Smoke-Control Doors: Install doors in accordance with NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing," Section 088853 "Security Glazing," and with hollow-metal manufacturer's written instructions.

### 3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
  - 1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
  - 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

### 3.4 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

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SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.
- B. Related Requirements:
  - 1. Section 233300 "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
  - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.
- D. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

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## 2.2 ACCESS DOORS AND FRAMES

### A. Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acudor Products, Inc.
  - b. Babcock-Davis.
  - c. Cendrex Inc.
  - d. JL Industries, Inc.; a division of the Activar Construction Products Group.
  - e. Karp Associates, Inc.
  - f. Larsens Manufacturing Company.
  - g. Metropolitan Door Industries Corp.
  - h. Milcor; Commercial Products Group of Hart & Cooley, Inc.
  - i. Nystrom, Inc.
2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Locations: Wall.
4. Door Size: As indicated on Drawings.
5. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.
6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock: Cam latch, screwdriver operated.

### B. Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Acudor Products, Inc.
  - b. Babcock-Davis.
  - c. Cendrex Inc.
  - d. JL Industries, Inc.; a division of the Activar Construction Products Group.
  - e. Karp Associates, Inc.
  - f. Larsens Manufacturing Company.
  - g. Metropolitan Door Industries Corp.
  - h. Milcor; Commercial Products Group of Hart & Cooley, Inc.
  - i. Nystrom, Inc.
2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
3. Locations: Wall and ceiling.
4. Door Size: As indicated on Drawings.
5. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.
6. Frame Material: Same material and thickness as door.
7. Latch and Lock: Cam latch, screwdriver operated.

### C. Recessed Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:



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- a. [Acudor Products, Inc.](#)
  - b. [Babcock-Davis.](#)
  - c. [Cendrex Inc.](#)
  - d. [JL Industries, Inc.; a division of the Activar Construction Products Group.](#)
  - e. [Karp Associates, Inc.](#)
  - f. [Larsens Manufacturing Company.](#)
  - g. [Metropolitan Door Industries Corp.](#)
  - h. [Milcor; Commercial Products Group of Hart & Cooley, Inc.](#)
  - i. [Nystrom, Inc.](#)
2. Description: Door face recessed 1/2 inch or 5/8 inch for gypsum board infill to match adjacent surface; with concealed flange for gypsum board installation and concealed hinge.
  3. Locations: Wall and ceiling.
  4. Door Size: As indicated on Drawings.
  5. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.
  6. Latch and Lock: Cam latch, screwdriver operated.

## 2.3 FIRE-RATED ACCESS DOORS AND FRAMES

### A. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
  - a. [Acudor Products, Inc.](#)
  - b. [Babcock-Davis.](#)
  - c. [Cendrex Inc.](#)
  - d. [JL Industries, Inc.; a division of the Activar Construction Products Group.](#)
  - e. [Karp Associates, Inc.](#)
  - f. [Larsens Manufacturing Company.](#)
  - g. [Metropolitan Door Industries Corp.](#)
  - h. [Milcor; Commercial Products Group of Hart & Cooley, Inc.](#)
  - i. [Nystrom, Inc.](#)
2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge.
3. Locations: Wall.
4. Door Size: As indicated on Drawings.
5. Fire-Resistance Rating: Not less than that of adjacent construction.
6. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage, factory primed.
7. Latch and Lock: Self-latching door hardware, operated by key.

### B. Fire-Rated, Flush Access Doors with Concealed Flanges:

1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
  - a. [Acudor Products, Inc.](#)
  - b. [Babcock-Davis.](#)
  - c. [Cendrex Inc.](#)
  - d. [JL Industries, Inc.; a division of the Activar Construction Products Group.](#)

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- e. Karp Associates, Inc.
- f. Metropolitan Door Industries Corp.
- g. Nystrom, Inc.

- 2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
- 3. Locations: Wall.
- 4. Door Size: As indicated on Drawings.
- 5. Fire-Resistance Rating: Not less than that of adjacent construction.
- 6. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage, factory primed.
- 7. Latch and Lock: Self-closing, self-latching door hardware, operated by key.

## 2.4 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Frame Anchors: Same material as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

## 2.5 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
  - 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.
- E. Latch and Lock Hardware:
  - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
  - 2. Keys: Furnish two keys per lock and key all locks alike.

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2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

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SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed entrance and storefront systems.
2. Ballistic resistant aluminum framed entrance and storefront systems.

B. Related Requirements:

1. Section 087111 "Door Hardware (Descriptive Specification)" for door hardware.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories.

C. Shop Drawings:

1. Plans, elevations, sections, full-size details, and attachments to other work.
2. Details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. Full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrance and storefront systems, showing the following:
  - a. Joinery, including concealed welds.
  - b. Anchorage.
  - c. Expansion provisions.
  - d. Glazing.
  - e. Flashing and drainage.
4. Connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
5. Point-to-point wiring diagrams showing the following:
  - a. Power requirements for each electrically operated door hardware.
  - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
6. Signed and sealed by the qualified professional engineer responsible for their preparation.

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- D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.
- E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- F. Delegated Design Submittals: For aluminum-framed entrances and storefront systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Test Reports: For aluminum-framed entrance and storefront systems, for tests performed by a qualified testing agency or manufacturer and witnessed by a qualified testing agency.
- C. Source Quality-Control Reports: For aluminum-framed entrance and storefront systems.
- D. Qualification Statements:
  - 1. For Installer and egress door inspector.
- E. Delegated Design Engineer Qualifications: For aluminum-framed entrance and storefront systems.
- F. Sample Warranties: For aluminum-framed entrance and storefront systems.

### 1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For aluminum-framed entrance and storefront systems.

### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.

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C. Egress Door Inspector Qualifications:

1. Inspector for field quality-control inspections of egress door assemblies to comply with qualifications set forth in NFPA 101, Ch. 7 "Means of Egress," Section "Means of Egress Components," Article "Inspection of Door Openings."

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.6 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace components of aluminum-framed entrance and storefront systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
  - a. Structural failures of framing and glazing components.
  - b. Faulty operation of door systems.
  - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
  - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
  - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
  - c. Cracking, peeling, or chipping.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

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## 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design aluminum-framed entrance and storefront systems.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrance and storefront systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Aluminum-framed entrance and storefront systems to withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- C. Structural Loads:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:
  - 1. Deflection Normal to Wall Plane: Limited to 1/175 of length of span of the framing member for lengths of up to 13 feet 6 inches and to 1/240 of length of span of the framing member plus 1/4 inch for lengths greater than 13 feet 6 inches.
  - 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
- E. Structural: Test in accordance with ASTM E330/E330M as follows:
  - 1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
  - 2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  - 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:
  - 1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

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- G. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
  2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- H. Seismic Performance: Aluminum-framed entrance and storefront systems to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.6 at design displacement and 1.5 times the design displacement.
- I. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
    - a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.41 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.
    - b. Entrance Doors: U-factor of not more than 0.68 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.
  2. Solar Heat-Gain Coefficient (SHGC):
    - a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.40 as determined in accordance with NFRC 200.
    - b. Entrance Doors: SHGC of not more than 0.40 as determined in accordance with NFRC 200.
  3. Air Leakage:
    - a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft. when tested in accordance with ASTM E283.
    - b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
  4. Condensation Resistance Factor (CRF):
    - a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.
    - b. Entrance Doors: CRF of not less than 63 as determined in accordance with AAMA 1503.
- J. Ballistic Resistance, UL 752: Listed and labeled when tested in accordance with UL 752 where indicated.



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- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
  - 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.
    - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    - b. Low Exterior Ambient-Air Temperature: 0 deg F.
    - c. Interior Ambient-Air Temperature: 75 deg F.

## 2.3 ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. EFCO Corporation
  - 2. Kawneer Company, Inc.; Arconic Corporation
  - 3. Old Castle Building Envelope (OBE)
  - 4. Tubelite Inc.
  - 5. YKK AP America Inc.
- B. Ballistic Resistant Aluminum-Framed Entrances and Storefronts 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. Defenselite; Impact Security, LLC.
  - 2. INSULGUARD Security Products.
  - 3. Total Security Solutions.
  - 4. U.S. Bulletproofing.
- C. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  - 1. Exterior Framing Construction: Thermally broken (standard system); thermally improved (ballistic resistant system).
  - 2. Interior Vestibule Framing Construction: Nonthermal.
  - 3. Glazing System: Retained mechanically with gaskets on four sides.
  - 4. Glazing Plane: Front.
  - 5. Finish: Clear anodic finish.
  - 6. Fabrication Method: Field-fabricated stick system.
  - 7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 8. Steel Reinforcement: As required by manufacturer.
- D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

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- E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- F. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
  - 1. Door Construction (Standard System): 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
  - 2. Door Construction (Ballistic Resistant System): 2-3/8-inch overall thickness, with manufacturers standard extruded-aluminum framing rail and stile system required to meet the indicated ballistic rating. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate tie rods.
  - 3. Door Design: Wide stile; 5-inch nominal width.
  - 4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
    - a. Provide nonremovable glazing stops on outside of door.
  - 5. Finish: Match adjacent storefront framing finish.

#### 2.4 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware is specified in Section 087111 "Door Hardware (Descriptive Specification)."

#### 2.5 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing" and Section 088853 "Security Glazing" for ballistic glazing.

#### 2.6 MATERIALS

- A. Sheet and Plate: ASTM B209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
- C. Structural Profiles: ASTM B308/B308M.
- D. Steel Reinforcement:
  - 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
  - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
  - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

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## 2.7 ACCESSORIES

- A. Automatic Door Operators: Section 087113 "Power Door Operators."
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
  - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.
- D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for **30-mil** thickness per coat.
- F. Rigid PVC filler.

## 2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing from interior.
  - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

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- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
  - 1. At interior and exterior doors, provide compression weather stripping at fixed stops.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
  - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
  - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

## 2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

- A. Comply with manufacturer's written instructions for standard and ballistic-resistant, aluminum-framed entrances and storefronts.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Seal perimeter and other joints watertight unless otherwise indicated.
- G. Metal Protection:

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1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
  2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.
- I. Install joint filler behind sealant as recommended by sealant manufacturer.
- J. Install components plumb and true in alignment with established lines and grades.
- K. Install entrance doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- L. Install glazing as specified in Section 088000 "Glazing" and Section 088853 "Security Glazing" at ballistic resistant aluminum-framed entrances and storefronts are indicated.

### 3.3 ERECTION TOLERANCES

- A. Install aluminum-framed entrance and storefront systems to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
  4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests.
- B. Inspection Agency: Engage a qualified inspector to perform inspections.
- C. Inspections:

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1. Egress Door Inspections: Inspect each aluminum-framed entrance door equipped with panic hardware, located in an exit enclosure, electrically controlled, and equipped with special locking arrangements, in accordance with NFPA 101, Ch. 7 "Means of Egress," Section "Means of Egress Components," Article "Inspection of Door Openings."
  - D. Aluminum-framed entrance and storefront systems will be considered defective if they do not pass tests and inspections.
  - E. Prepare test and inspection reports.
- 3.5 ENTRANCE DOOR HARDWARE SETS
- A. See Specification Section 087111 "Door Hardware (Descriptive Specification)."

END OF SECTION

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SECTION 085653 - SECURITY WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed, transaction security windows.

1.2 COORDINATION

- A. Coordinate installation of anchorages for security windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjacent construction.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes for window units.
- C. Shop Drawings: For security windows.
1. Include plans, elevations, sections, and attachment details.
  2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
  3. Glazing details.
  4. Details of deal tray.
- D. Delegated Design Submittal: For security windows indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer.
- C. Welding certificates.

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- D. Product Test Reports: For each type of security window and accessory indicated as ballistics resistant, for tests performed by a qualified testing agency.
- E. Examination reports documenting inspections of substrates, areas, and conditions.
- F. Sample Warranty: For special warranty.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
  - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 2. AWS D1.6, "Structural Welding Code - Stainless Steel."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Pack security windows in wood crates for shipment. Crate glazing separate from frames unless factory glazed.
- B. Label security window packaging with drawing designation.
- C. Store crated security windows on raised blocks to prevent moisture damage.

#### 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

#### 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace security windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including deflections exceeding 1/4 inch.
    - b. Failure of welds.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
  - 2. Warranty Period: Three years from date of Substantial Completion.



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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Attack Resistance: Provide units identical to those tested for compliance with requirements indicated, and as follows:
  - 1. Ballistics Resistance, Forced-Entry Resistance, HPW-TP-0500.03: Class HG1 – Handgun – Low, in accordance with HPW-TP-0500.03.

2.2 FIXED, TRANSACTION SECURITY WINDOWS

- A. Provide fixed, transaction security windows with operable sash or ventilator capable of allowing transfer of currency and documents.
  - 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. Armortex.
    - b. Defenselite; Impact Security, LLC.
    - c. INSULGUARD Security Products.
    - d. National Bullet Proof, Inc.
    - e. Total Security Solutions.
    - f. U.S. Bulletproofing.
- B. Configuration: One fixed-glazed panel.
- C. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum as follows:
  - 1. Profile: Manufacturer's standard, with minimum face dimension indicated.
    - a. Minimum Face Dimension: 2 inches.
  - 2. Depth: Manufacturer's standard.
- D. Head and Jamb Framing: Designed for voice communication by speech at normal volume.
- E. Voice-Communication-Type Sill: Formed from stainless steel and designed to allow voice communication by speech at normal volume.
  - 1. Transaction Counter: Stainless steel, 12 inches deep by width of security window, with integral deal tray centered in opening.
- F. Glazing and Glazing Materials: Comply with requirements in Section 088853 "Security Glazing."
- G. Glazing Meeting Edges: Polished glazing.
- H. Materials:

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1. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304.
2. Aluminum Extrusions: ASTM B221. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength.
3. Aluminum Sheet and Plate: ASTM B209.

## 2.3 FABRICATION

- A. General: Fabricate security windows to provide a complete system for assembly of components and anchorage of window units.
  1. Provide units that are reglazable from the secure side without dismantling the attack side of framing.
  2. Prepare security windows for field glazing unless preglazing at the factory is indicated.
- B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.
  1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.
- C. Glazing Stops: Finish glazing stops to match security window framing.
  1. Attack-Side (Exterior) Glazing Stops: Welded or integral to framing.
  2. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.
- D. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- E. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- F. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated. Installation orientation of glazing to meet performance requirements. Comply with requirements in Section 088853 "Security Glazing."

## 2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 1. Run grain of directional finishes with long dimension of each piece.
- C. Stainless Steel Sheet and Plate Finishes:
  - 1. Directional Satin Finish: ASTM A480/A480M, No. 4.

2.7 ACCESSORIES

- A. Recessed Deal Trays: Formed from stainless steel; fabricated in curved shape with exposed flanges for recessed installation into horizontal surface.
  - 1. Clear Opening Size: 16 inches wide by 11 inches deep by 1-1/2 inches high.
- B. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.
  - 1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
  - 2. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
  - 3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
  - 4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- C. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B633; provide sufficient strength to withstand design pressures indicated.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- E. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant remains permanently elastic, nonshrinking, and nonmigrating.

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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 security windows.
- B. Examine roughing-in for built-in anchors to verify actual locations of security window connections before security window installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of security windows.
- D. For factory-installed glazing materials whose orientation (secure or attack side) is critical for performance, verify installation orientation.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.
- B. Voice-Communication-Type Framing: Attach removable glass spacers to jambs and head of glazing, located not more than 6 inches from each corner and spaced not more than 12 inches o.c or
- C. Glazed Framing: Provide manufacturer's standard glazed framing. Comply with installation requirements in Section 088853 "Security Glazing."
- D. Removable Glazing Stops and Trim: Fasten components with security fasteners.
- E. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials. Provide stainless steel fasteners in stainless steel materials.
- F. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.
  - 1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.
  - 2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.
- G. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

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3.3 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- C. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

3.4 ADJUSTING

- A. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING AND PROTECTION

- A. Clean surfaces promptly after installation of security windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
- B. Clean glass of preglazed security windows promptly after installation. Comply with requirements in Section 088853 "Security Glazing" for cleaning and maintenance.
- C. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

END OF SECTION

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SECTION 087111 - DOOR HARDWARE (DESCRIPTIVE SPECIFICATION)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hinges.
2. Continuous, gear-type hinges.
3. Mortise locks.
4. Electric strikes.
5. Exit devices and auxiliary items.
6. Lock cylinders.
7. Operating trim.
8. Surface closers.
9. Wall- and floor-mounted stops.
10. Electromagnetic door holders.
11. Door gasketing.
12. Thresholds.
13. Auxiliary electrified door hardware.

B. Related Requirements:

1. Section 087113 "Power Door Operators" for hard-wired, low-energy power operators and low-energy power-assist operators.
2. Section 281000 "Access Control" for coordination of access control system components.
3. Section 281400 "Access Control System Hardware" for access control system units, power, battery chargers, and computer equipment.
4. Section 283100 "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion-detection system.
5. Section 283176 "Fire Alarm and Voice Evacuation" for connections to building fire alarm system.

1.2 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory 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.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

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- D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field-verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Conference participants must include Installer's Architectural Hardware Consultant and Owner's security consultant.
- B. Keying: The Owner will manage all keying tasks in-house.

### 1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: For electrified door hardware.
  - 1. Include diagrams for power, signal, and control wiring.
  - 2. Include details of interface of electrified door hardware and building safety and security systems.
- D. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
- E. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Submittal Sequence: Submit door hardware schedule after or concurrent with submissions of product data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
  - 2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
  - 3. Content: Include the following information:
    - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
    - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.

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- c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
  - d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
  - e. Fastenings and other installation information.
  - f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
  - g. Mounting locations for door hardware.
  - h. List of related door devices specified in other Sections for each door and frame.
- F. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer and Architectural Hardware Consultant.
- C. Product Certificates: For each type of electrified door hardware.
  - 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- D. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- E. Field quality-control reports.
- F. Sample Warranty: For special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- C. Schedules: Final door hardware and keying schedule.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.



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1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedule.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

- B. Architectural Hardware Consultant Qualifications: A 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 who is currently certified by DHI as a Door and Hardware Specification Consultant (DHSC), an Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC), or an Architectural Opening Consultant (AOC).

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lockup for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. The Contractor/Hardware Supplier will be provided a letter of authorization from the Owner to order the restricted keys used by the Owner. The letter will be provided upon request.
- D. Deliver keys and permanent cores to Owner, State of Maine, BGS Lock Shop, Attn: Gary Tibbets, 15 Columbia Street, Augusta, ME 04330, by registered mail or overnight package service.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures, including excessive deflection, cracking, or breakage.
    - b. Faulty operation of doors and door hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
  2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
    - a. Exit Devices: Two years from date of Substantial Completion.
    - b. Manual Closers: 10 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of door hardware from single manufacturer.
  - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested in accordance with UL 1784 and installed in compliance with NFPA 105.
  - 1. Air-Leakage Rate: Maximum air leakage of 0.3 cfm per sq. ft. at the tested pressure differential of 0.3 inch wg of water.
- C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the USDOJ's "2010 ADA Standards for Accessible Design" and the ABA standards of the Federal agency having jurisdiction.
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
  - 2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
    - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
  - 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
  - 5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

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## 2.3 HINGES

- A. Hinges: ANSI/BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. McKinney Products Company; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY
    - b. STANLEY; dormakaba USA, Inc.
- B. Antifriction-Bearing Hinges:
  - 1. Mounting: Full mortise (butts).
  - 2. Bearing Material: Manufacturer's standard antifriction bearing.
  - 3. Grade 1 (heavy weight).
  - 4. Base and Pin Metal:
    - a. Interior Hinges: Stainless steel with stainless steel pin.
    - b. Hinges for Fire-Rated Assemblies: Stainless steel with stainless steel pin.
  - 5. Pins: Nonrising loose unless otherwise indicated.
    - a. Outswinging Corridor Doors with Locks: Nonremovable.
  - 6. Tips: Flat button.
  - 7. Corners: Square.
- C. Electrified Antifriction-Bearing Hinges: Full-mortise mounting.
  - 1. Bearing Material: Manufacturer's standard antifriction bearing.
  - 2. Grade 1 (heavy weight).
  - 3. Base and Pin Metal:
    - a. Interior Hinges: Stainless steel with stainless steel pin.
    - b. Hinges for Fire-Rated Assemblies: Stainless steel with stainless steel pin.
  - 4. Pins: Nonrising loose unless otherwise indicated.
    - a. Outswinging Corridor Doors with Locks: Nonremovable.
  - 5. Tips: Flat button.
  - 6. Corners: Square.
  - 7. Electric Feature: Concealed electric through wires.

## 2.4 CONTINUOUS HINGES

- A. Continuous, Gear-Type Hinges: ANSI BHMA A156.26; minimum 0.120-inch-thick, extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings. Minimum overall width of 4 inches; fabricated

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to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Pemko Manufacturing Company Inc.; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY
  - b. STANLEY; dormakaba USA, Inc.
2. Basis-of-Design Product: Subject to compliance with requirements, provide "SL 11 Concealed Geared Continuous Hinge," Select Hinges, for ballistic resistant aluminum entrance, or comparable product acceptable to the ballistic resistant aluminum entrance manufacturer.
3. Grade 1-300 and Grade 1-600 at ballistic resistant aluminum entrance doors.
4. Hinges for Fire-Rated Assemblies: With steel fire pins to hold fire-rated doors in place if required by tested listing.
5. Mounting: Concealed leaf.
6. Electric Feature: Electric through wires.

## 2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
  1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
  1. Description: Lever to match existing building standard.
  2. Levers: Cast.
    - a. Construction: Solid.
  3. Escutcheons (Roses): Cast.
  4. Dummy Trim: Match lever lock trim and escutcheons.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
  1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  2. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

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- F. Mortise Locks: ANSI/BHMA A156.13, Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Schlage; Allegion plc
    - b. SARGENT Manufacturing Company; ASSA ABLOY

## 2.6 ELECTRIC STRIKES

- A. Electric Strikes: ANSI/BHMA A156.31, Grade 1; with faceplate to suit lock and frame.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Hanchett Entry Systems (HES), Inc.; ASSA ABLOY Group
  - 2. Material: Stainless steel.
  - 3. Mounting: Mortised.
  - 4. Fire-Rated Door Assemblies: Use fail-secure electric strikes with fire-rated devices.
  - 5. Features: Lip extension kit.

## 2.7 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: ANSI/BHMA A156.3.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Von Duprin; Allegion plc
    - b. SARGENT Manufacturing Company; ASSA ABLOY
- B. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing in accordance with UL 305.
- C. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing in accordance with UL 305 and NFPA 252.
- D. Surface Vertical-Rod Exit Devices: Grade 1.
  - 1. Type 2.
  - 2. Actuating Bar: Push pad.
  - 3. Material: Stainless steel.
  - 4. Configuration: Top and bottom rods or top rod as scheduled.
  - 5. Electrified Features:
    - a. Electric locking and unlocking.

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- E. Exit Device Outside Trim: Pull with cylinder as scheduled; material and finish to match locksets unless otherwise indicated.
- F. Through-Bolt Fasteners: For exit devices and trim on metal doors.

## 2.8 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
  - 1. Manufacturers: Provide Kaba 3850-25-1007 PK1 lock cylinders by KABA; dormakaba Group.
- B. Standard Lock Cylinders: ANSI/BHMA A156.5, Grade 1 permanent cores; face finished to match lockset.
  - 1. Core Type: Interchangeable.
  - 2. Number of Pins: Seven.
  - 3. Lock Type: Mortise type.
  - 4. Format: Small Format Interchangeable Core (SFIC).
- C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

## 2.9 KEYING

- A. Keys: Nickel silver.
  - 1. Provide two key blanks for each lock. Coordinate ordering of the required restricted keys with the Owner.
  - 2. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
    - a. Provide key type KABA 3800-00-0003-PK1-C95W21; KABA; dormakaba Group.

## 2.10 OPERATING TRIM

- A. Operating Trim: ANSI/BHMA A156.6; stainless steel unless otherwise indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ives; Allegion plc.
    - b. Burns Manufacturing Incorporated
    - c. Rockwood Manufacturing Company; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY
- B. Push-Pull Plates: With square corners, beveled edges, and raised integral lip; secured with exposed screws.

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1. Thickness: 1/8 inch.
2. Size: 3-1/2 inches wide by 15-3/4 inches high.
3. Mounting: Through bolted with oval-head machine screws and counter sunk washers.
4. Minimum Clearance: 1-1/2 inches from face of door.

C. Straight Door Pulls:

1. Type: 3/4-inch constant-diameter pull.
2. Mounting: Through bolted with oval-head machine screws and countersunk washers.
3. Minimum Clearance: 1-1/2 inches from face of door.
4. Overall Length: 36 inches.

D. Offset Door Pulls: 1-inch constant-diameter pull.

1. Mounting: Through bolted with oval-head machine screws and countersunk washers.
2. Offset: 2 inches.
3. Minimum Clearance: 2-1/4 inches from face of door.
4. Overall Length: 9 inches.

## 2.11 SURFACE CLOSERS

- A. Surface Closers: ANSI/BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Von Duprin; Allegion plc
  - b. SARGENT Manufacturing Company; ASSA ABLOY

- B. Surface Closer with Cover: Grade 1; modern type with mechanism enclosed in cover.

1. Mounting: Parallel arm.
2. Type: Regular arm.
3. Backcheck: Adjustable, effective between 60 and 85 degrees of door opening.
4. Cover Material: Aluminum.
5. Closing Power Adjustment: At least 50 percent more than minimum tested value.

## 2.12 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: ANSI/BHMA A156.16; aluminum base metal. Provide wall bumpers unless floor stop is the only practical option.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Glynn Johnson; Allegion plc.

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- b. Ives, Allegion plc.
  - c. Rockwood Manufacturing Company; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY
- B. Dome-Type Floor Stop: Grade 1; with minimum 1-inch-high bumper for doors without threshold and 1-3/8-inch-high bumper for doors with threshold.
  - 1. Provide with extruded-aluminum riser for carpet installations.
- C. Wall Bumpers: Grade 1; with rubber bumper; 2-1/2-inch diameter, minimum 3/4-inch projection from wall; with backplate for concealed fastener installation.
  - 1. Bumper Configuration: Concave.

## 2.13 ELECTROMAGNETIC STOPS AND HOLDERS

- A. Electromagnetic Door Holders: ANSI/BHMA A156.15, Grade 1; wall-mounted electromagnetic single unit with strike plate attached to swinging door; coordinated with fire detectors and interfaced with building security system.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Schlage; Allegion plc.
    - b. SARGENT Manufacturing Company; ASSA ABLOY.

## 2.14 DOOR GASKETING

- A. Door Gasketing: ANSI/BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. National Guard Products, Inc
    - b. Pemko Manufacturing Company Inc.; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY
    - c. Reese Enterprises, Inc
- B. Maximum Air Leakage: When tested in accordance with ASTM E283/E283M with tested pressure differential of 0.3 inch wg, as follows:
  - 1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
  - 2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
  - 3. Gasketing on Double Doors: 0.50 cfm per ft. of door opening.
- C. Adhesive-Backed Perimeter Gasketing: Vinyl bulb, neoprene bulb, or sponge neoprene gasket material applied to frame rabbet with self-adhesive.
- D. Rigid, Housed, Perimeter Gasketing: Sponge neoprene or vinyl bulb gasket material held in



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place by housing; fastened to frame stop with screws.

1. Housing Material: Aluminum.
- E. Meeting Astragals for Meeting Stiles: Neoprene bulb or vinyl bulb gasket material held in place by housing; mounted with screws.
1. Housing Material: Aluminum or bronze.
  2. Mounting: Surface-mounted.
- F. Door Sweeps: Neoprene, vinyl, or silicone gasket material held in place by flat housing or flange; surface mounted to face of door with screws.
1. Housing or Flange Material: Aluminum.

## 2.15 THRESHOLDS

- A. Thresholds: ANSI/BHMA A156.21; fabricated to full width of opening indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. National Guard Products, Inc
    - b. Pemko Manufacturing Company Inc.; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY
    - c. Reese Enterprises, Inc
- B. Saddle Thresholds:
1. Type: Fluted top, barrier free.
  2. Base Metal: Aluminum.

## 2.16 AUXILIARY DOOR HARDWARE

- A. Auxiliary Door Hardware: ANSI/BHMA A156.16.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Rockwood Manufacturing Company; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY
- B. Silencers for Metal Door Frames: Grade 1; neoprene or rubber; minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

## 2.17 AUXILIARY ELECTRIFIED DOOR HARDWARE

- A. Auxiliary Electrified Door Hardware: ANSI/BHMA A156.35.

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1. Manufacturers: Subject to compliance with requirements ,provide products by one of the following:
  - a. Schlage; Allegion plc.
  - b. SARGENT Manufacturing Company; ASSA ABLOY
- B. Door Position Switches: Magnetically operated reed switch designed for concealed mounting.
- C. Door and Frame Transfer Devices: Steel housing for mortise in hinge stile of door, with flexible tube for wiring bundle; accommodating doors that swing open to 120 degrees.

## 2.18 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.
  1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and ANSI/BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended; however, aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
  1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
  2. Fire-Rated Applications:
    - a. Steel Through Bolts: For the following unless door blocking is provided:
      - 1) Surface hinges to doors.
      - 2) Closers to doors and frames.
      - 3) Surface-mounted exit devices.
  3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
  4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

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2.19 FINISHES

- A. Provide finishes complying with ANSI/BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 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 of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames in accordance with ANSI/SDI A250.6.

3.3 INSTALLATION OF DOOR HARDWARE

- A. Mounting Heights: Mount door hardware units at heights unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

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2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  1. Replace construction cores with permanent cores as directed by Owner.
- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- F. 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 will impede traffic.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
  1. Do not notch perimeter gasketing to install other surface-applied hardware.
- H. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
  1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
  2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant is to examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

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3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, maintenance service is to include six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.

3.8 DOOR HARDWARE SCHEDULE

Door Hardware Set No. 1 (C2, C3)

|       |                     |   |
|-------|---------------------|---|
| 2     | Continuous Hinges   | Pemko; "FM Full Mortise" electric transfer.   |
| 2     | Exit Devices        | Sargent; "8700 Surface Mounted Vertical Rod Exit Device, Function 03" with electric latch retraction. |
| 2     | Pulls               | Sargent; "862 Offset Pull"  |
| 2     | Cylinders           | Dormakaba; "KABA 3850-25-1007 PK1".   |
| 2     | PowerDoor Operators | Horton.   |
| 1 set | Weatherstripping    |   |
|       | Head                | Pemko; "2891 Series".   |
|       | Jamb                | Pemko; "285 Series".  |
|       | Meeting Rail        | Pemko; "354 Series".  |
|       | Sweep               | Pemko; "315 Series".  |
|       | Threshold           | Pemko "1710 Series".  |

\*Coordinate with Division 28 ELECTRONIC SAFETY AND SECURITY  
for access control hardware and fire alarm connections.

\*\* See Section 087113 "Power Door Operators".

Door Hardware Set No. 2 (Door 111, 125)

|   |                   |   |
|---|-------------------|---|
| 2 | Continuous Hinges | Select Hinges; "SL 11 Concealed Continuous Geared Hinge", electric transfer.                          |
| 2 | Exit Devices      | Sargent; "8700 Surface Mounted Vertical Rod Exit Device, Function 03" with electric latch retraction. |
| 2 | Pulls             | Sargent; "862 Offset Pull"  |
| 2 | Cylinders         | Dormakaba; "KABA 3850-25-1007 PK1".   |

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|       |                      |                       |
|-------|----------------------|-----------------------|
| 2     | Power Door Operators | Horton.               |
| 1 set | Weatherstripping     |                       |
|       | Head                 | Pemko; "2891 Series". |
|       | Jamb                 | Pemko; "285 Series".  |
|       | Meeting Rail         | Pemko; "354 Series".  |

\*Coordinate with Division 28 ELECTRONIC SAFETY AND SECURITY for access control hardware and fire alarm connections.

\*\* See Section 087113 "Power Door Operators".

Door Hardware Set No. 3 (Door 124)

|   |                              |  |
|---|------------------------------|--|
| 4 | Continuous Hinges            | Select Hinges; "SL 11 Concealed Continuous Geared Hinge", electric transfer.                                       |
| 2 | Exit Devices                 | Sargent; "NB-8700 Top Latch Surface Mounted Vertical Rod Exit Device, Function 03" with electric latch retraction. |
| 2 | Levers                       | Sargent; Match existing building standard.   |
| 2 | Cylinders                    | Dormakaba; "KABA 3850-25-1007 PK1".  |
| 2 | Closers                      | LCN; "4040XP Series (parallel arm)"  |
| 2 | Electromagnetic Door Holders | Sargent; "1561 Flush Electromagnetic Door Hold".   |
| 2 | Doorstops                    | Ives; "FS13 Dome (floor)/WS401CVS Convex (wall)"   |

\*Coordinate with Division 28 ELECTRONIC SAFETY AND SECURITY for access control hardware, fire alarm connections, and safety strobe connections.

Door Hardware Set No. 4 (Door 138A)

|       |                      |   |
|-------|----------------------|---|
| 2     | Continuous Hinges    | Select Hinges; "SL 11 Concealed Continuous Geared Hinge", electric transfer.                          |
| 2     | Exit Devices         | Sargent; "8700 Surface Mounted Vertical Rod Exit Device, Function 03" with electric latch retraction. |
| 2     | Pulls                | Rockwood; "Tubular Door Pull RM324"   |
| 2     | Cylinders            | Dormakaba; "KABA 3850-25-1007 PK1".   |
| 2     | Power Door Operators | Horton.   |
| 1 set | Weatherstripping     |   |
|       | Head                 | Pemko; "2891 Series".   |
|       | Jamb                 | Pemko; "285 Series".  |
|       | Meeting Rail         | Pemko; "354 Series".  |

\*Coordinate with Division 28 ELECTRONIC SAFETY AND SECURITY for access control hardware and fire alarm connections.

\*\* See Section 087113 "Power Door Operators".

Door Hardware Set No. 5 (Door 138B)

|   |                      |  |
|---|----------------------|--|
| 2 | Continuous Hinges    | Select Hinges; "SL 11 Concealed Continuous Geared Hinge", electric transfer.   |
| 2 | Exit Devices         | Sargent; "8700 Surface Mounted Vertical Rod Exit Device, Function 01" with electric latch retraction no exterior trim. |
| 2 | Power Door Operators | Horton.  |
| 1 | Doorstop             | Ives; "FS13 Dome (floor)/WS401CVS Convex (wall)"   |

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|       |                  |                       |
|-------|------------------|-----------------------|
| 1 set | Weatherstripping |                       |
|       | Head             | Pemko; "2891 Series". |
|       | Jamb             | Pemko; "285 Series".  |
|       | Meeting Rail     | Pemko; "354 Series".  |

\*Coordinate with Division 28 ELECTRONIC SAFETY AND SECURITY for access control hardware and fire alarm connections.

\*\* See Section 087113 "Power Door Operators".

Door Hardware Set No. 6 (Door 102B, 102C, 102E, 110)

|   |                 |  |
|---|-----------------|--|
| 3 | Hinges          | McKinney; "TCA3386, heavy-weight".               |
| 1 | Lockset         | Sargent; "8200 Mortise Locks", Storage (F07)     |
| 1 | Cylinder        | Dormakaba; "KABA 3850-25-1007 PK1".              |
| 1 | Electric Strike | Hes; "1600"                                      |
| 1 | Closer          | LCN; "4040XP Series (parallel arm)"              |
| 1 | Doorstop        | Ives; "FS13 Dome (floor)/WS401CVS Convex (wall)" |

Door Hardware Set No. 7 (Door 111A, 111B)

|   |          |  |
|---|----------|--|
| 3 | Hinges   | McKinney; "TCA3386, heavy-weight".               |
| 1 | Lockset  | Sargent; "8200 Mortise Locks", Office (F04)      |
| 1 | Cylinder | Dormakaba; "KABA 3850-25-1007 PK1".              |
| 1 | Closer   | LCN; "4040XP Series (parallel arm)"              |
| 1 | Doorstop | Ives; "FS13 Dome (floor)/WS401CVS Convex (wall)" |

Door Hardware Set No. 8 (Door 102D, 102F, 102G, 102H)

|   |          |  |
|---|----------|--|
| 3 | Hinges   | McKinney; "TCA3386, heavy-weight".               |
| 1 | Lockset  | Sargent; "8200 Mortise Locks", Office (F04)      |
| 1 | Cylinder | Dormakaba; "KABA 3850-25-1007 PK1".              |
| 1 | Doorstop | Ives; "FS13 Dome (floor)/WS401CVS Convex (wall)" |

Door Hardware Set No. 9 (Door 108, 109)

|   |          |  |
|---|----------|--|
| 3 | Hinges   | McKinney; "TCA3386, heavy-weight".   |
| 1 | Lockset  | Sargent; "8200 Mortise Locks", Privacy (F22) with V20 indicator outside (occupied/vacant green/red). |
| 1 | Closer   | LCN; "4040XP Series (parallel arm)"  |
| 1 | Doorstop | Ives; "FS13 Dome (floor)/WS401CVS Convex (wall)"   |

Reuse salvaged Privacy Lockset (from Women's 129) at Door 108.

Door Hardware Set No. 10 (Door 124A)

|   |          |  |
|---|----------|--|
| 3 | Hinges   | Stanley; "CB199 Heavy-Weight Concealed Bearing, Satin Stainless Steel" |
| 1 | Lockset  | Sargent; "8200 Mortise Locks", Storage (F07)                           |
| 1 | Cylinder | Dormakaba; "KABA 3850-25-1007 PK1"                                     |
| 1 | Closer   | LCN; "4040XP Series (parallel arm)"                                    |
| 1 | Doorstop | Ives; "FS13 Dome (floor)/WS401CVS Convex (wall)"                       |

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Door Hardware Set No. 11 (Door 102)

|   |                             |  |
|---|-----------------------------|--|
| 3   | Hinges                      | McKinney; "TCA3386, heavy-weight"                |
| 1   | Lockset                     | Sargent; "8200 Mortise Locks", Passage (F01)     |
| 1   | Electromagnetic Door Holder | Sargent; "1561 Flush Electromagnetic Door Hold"  |
| 1   | Closer                      | LCN; "4040XP Series (parallel arm)"              |
| 1   | Doorstop                    | Ives; "FS13 Dome (floor)/WS401CVS Convex (wall)" |
| *Coordinate with Division 28 ELECTRONIC SAFETY AND SECURITY for access control hardware and fire alarm connections. |                             |  |

END OF SECTION



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SECTION 087113 - POWER DOOR OPERATORS

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. Power door operators for swinging doors.
  - 2. Low-energy door operators for swinging doors.

1.3 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. Activation Device: A hard-wired control that, when actuated, sends an electrical signal to the door operator to open the door.
- C. Double-Egress (Doors): A pair of doors that simultaneously swing, with the two doors moving in opposite directions with no mullion between them.
- D. Double-Swing (Doors): A pair of doors that swing, with the two doors moving in opposite directions with a mullion between them; each door functioning as a single-swing door.
- E. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
- F. For automatic door terminology, see BHMA A156.10 and BHMA A156.19 for definitions of terms.

1.4 COORDINATION

- A. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing power door operators.
- B. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.
- C. Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to the following:
  - 1. Power supplies.
  - 2. Access-control system.

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1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for power door operators.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- C. Shop Drawings: For power door operators.
  - 1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
  - 2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Indicate locations of activation and safety devices.
  - 4. Include diagrams for power, signal, and control wiring.
  - 5. Include plans, elevations, sections, and attachment details for guide rails.
- D. Samples: For each exposed product and for each color and texture specified, manufacturer's standard size.

1.7 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer and Certified Inspector.
- C. Product Certificates: For each type of power door operator.
- D. Field quality-control reports.
- E. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For power door operators, safety devices, and control systems, to include in maintenance manuals.

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1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project and who employs a Certified Inspector.
  - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Certified Inspector Qualifications: Certified by AAADM.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of power door operators that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Faulty or sporadic operation of power door operator, including controls.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.
  - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Horton Automatics; Overhead Door Corporation (no substitutes).
- B. Source Limitations: Obtain power door operators, including activation and safety devices, from single source from single manufacturer.

2.2 POWER DOOR OPERATORS, GENERAL

- A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated; and in accordance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
  - 1. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load indicated on Drawings.
- B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking

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action of electric motor, connections for power and activation- and safety-device wiring, and manual operation, including spring closing when power is off.

- C. Hinges: See Section 087111 "Door Hardware (Descriptive Specification)" for hinge type for each door that door operator shall accommodate.
- D. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch-thick, extruded or formed aluminum; manufacturer's standard width; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
- E. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.
- 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.

### 2.3 POWER DOOR OPERATORS FOR SWINGING DOORS

- A. Standard: BHMA A156.10.
- B. Performance Requirements:
  - 1. Opening Force:
    - a. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails; not more than 15 lbf required to open door to minimum required width.
    - b. Power-Operated Swinging Doors: Not more than 30 lbf required to manually open door if power fails.
    - c. Breakaway Device for Power-Operated Doors: Not more than 50 lbf required for breakaway door or panel to open.
  - 2. Entrapment-Prevention Force: Not more than 40 lbf required to prevent stopped door in the last 10 degrees of opening from moving in the direction of opening; not more than 30 lbf required to prevent stopped door from moving in direction of closing.
- C. Configuration: Operator to control pair of swinging doors.
  - 1. Traffic Pattern: One way and two way as indicated on Drawings.
  - 2. Operator Mounting: Surface.
- D. Operation: Power opening and spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.10.
- E. Operating System: Electromechanical.
- F. Microprocessor Control Unit: Solid-state controller.
- G. Features:
  - 1. Adjustable opening and closing speed.
  - 2. Adjustable opening and closing force.

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3. Adjustable backcheck.
  4. Adjustable hold-open time from zero to 30 seconds.
  5. Adjustable time delay.
  6. Adjustable acceleration.
  7. Adjustable limit switch.
  8. Obstruction recycle.
  9. Power door re-open if stopped while closing.
  10. On-off/hold-open switch to control electric power to operator.
- H. Controls: Activation and safety devices as indicated on Drawings and in accordance with BHMA standards.
1. Activation Device, Switch: Push-plate switch on each side of door to activate door operator.
  2. Safety Device, Presence Sensor: Mounted on door header to detect pedestrians in presence zone and to prevent door from closing.
- I. Exposed Finish: Class II, clear anodic finish or baked-enamel or powder-coat finish.
1. Color: As selected by Architect from full range of industry colors and color densities.
- J. Coordinate operator requirements with weight of door leafs.

## 2.4 LOW-ENERGY DOOR OPERATORS FOR SWINGING DOORS

- A. Standard: BHMA A156.19.
- B. Performance Requirements:
1. Opening Force if Power Fails: Not more than 15 lbf required to release latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
  2. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.
- C. Configuration, Pair: Operator to control pair of swinging doors.
1. Traffic Pattern: One way and two way as indicated on Drawings.
  2. Operator Mounting: Surface.
- D. Operation: Power opening and power-assisted spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
- E. Operating System: Electromechanical.
- F. Microprocessor Control Unit: Solid-state controller.
- G. Features:
1. Adjustable opening and closing speed.
  2. Adjustable opening and closing force.

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3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.
6. Adjustable acceleration.
7. Obstruction recycle.
8. On-off/hold-open switch to control electric power to operator.

- H. Activation Device: Push-plate switch to activate door operator.
- I. Exposed Finish: Class II, clear anodic finish or baked-enamel or powder-coat finish.
1. Color: As selected by Architect from full range of industry colors and color densities.
- J. Coordinate operator requirements with weight of door leafs.

## 2.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Extrusions: ASTM B221.
  2. Sheet: ASTM B209.
- B. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

## 2.6 CONTROLS

- A. General: Provide controls, including activation and safety devices, in accordance with BHMA standards; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.
- B. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator with contrasting-colored, engraved message.
1. Configuration:
    - a. Round (at State House), square (at Cross Office Building) push plate with 4-by-4-inch junction box.
      - 1) Mounting: As indicated on Drawings.
  2. Push-Plate Material: Stainless steel (at State House) or plastic (at Cross Office Building) as selected by Architect from manufacturer's full range.
  3. Message: International symbol of accessibility and "Push to Open."
- C. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

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2.7 ACCESSORIES

- A. Signage: As required by cited BHMA standard for type of door and its operation.
  - 1. Application Process: Operator manufacturer's standard process.
  - 2. Provide sign materials with instructions for field application when operators are installed.

2.8 FABRICATION

- A. Factory fabricate power door operators to comply with indicated standards.
- B. Form aluminum shapes before finishing.
- C. Fabricate exterior components to drain condensation and water-passing joints within operator enclosure to the exterior.
- D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.

2.9 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary, protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.10 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of power door operators.
- B. Examine roughing-in for electrical systems to verify actual locations of power connections before power door operator installation.
- C. Verify that full-height finger guards are installed at each door with pivot hinges, where door has a clearance at hinge side greater than 1/4 inch and less than 3/4 inch with door in any position.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION, GENERAL

- A. Install power door operators in accordance with manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.
  - 1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
  - 2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
- B. Controls: Install activation and safety devices in accordance with manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Access-Control System: Connect operators to access-control system as specified in Section 281500 "Access Control Hardware Devices."
- D. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.
- E. Guide Rails: Install in accordance with BHMA A156.10, including Appendix A and manufacturer's written instructions unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Certified Inspector: Engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Test and inspect each power door operator installation, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.
- C. Power door operators will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust power door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
  - 1. Adjust operators on exterior doors for tight closure.
- B. After completing installation of power door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.



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- C. Readjust power door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).
- D. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of power door operator Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
  - 2. Perform maintenance, including emergency callback service, during normal working hours.
  - 3. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain power door operators.

END OF SECTION

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SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Laminated glass.
3. Insulating glass.
4. Glazing sealants.
5. Glazing tapes.
6. Miscellaneous glazing materials.

B. Related Requirements:

1. Section 088853 "Security Glazing."

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.

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- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
  - 1. Tinted glass.
  - 2. Coated glass.
  - 3. Laminated glass.
  - 4. Insulating glass.
  - 5. Spandrel glass.
- D. Glazing Accessory Samples: For sealants, in 12-inch lengths.
- E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- F. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer, manufacturers of fabricated glass units, and glass testing agency.
- C. Product Test Reports: For fabricated glass, for tests performed by a qualified testing agency.
- D. Sample Warranties: For special warranties.

#### 1.6 QUALITY ASSURANCE

- A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved by primary glass manufacturer.
- B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

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- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

## 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

## 1.9 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Source Limitations for Glass: Obtain tinted glass from single source from single manufacturer.
- B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

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## 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
  - 1. Design Wind Pressures: As indicated on Drawings.
    - a. Wind Design Data: As indicated on Drawings.
  - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
  - 3. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
  - 2. For laminated-glass lites, properties are based on products of construction indicated.
  - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  - 4. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F.
  - 5. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
  - 6. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

## 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
  - 2. IGMMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

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- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.
  - 1. Minimum Glass Thickness for Exterior Lites: 6 mm unless indicated otherwise.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturer's offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. AGC Glass Company North America, Inc.
    - b. Guardian Glass LLC
    - c. Pilkington North America; NSG Group
    - d. Saint-Gobain Glass Corp
    - e. Vitro Architectural Glass
- B. Low-Iron Annealed Float Glass: ASTM C1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturer's offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. AGC Glass Company North America, Inc.
    - b. Guardian Glass LLC
    - c. Pilkington North America; NSG Group
    - d. Saint-Gobain Glass Corp
    - e. Vitro Architectural Glass
- C. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.
  - 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. AGC Glass Company North America, Inc.

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- b. Guardian Glass LLC
  - c. Pilkington North America; NSG Group
  - d. Saint-Gobain Glass Corp
  - e. Vitro Architectural Glass
- D. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- E. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.
  - 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. Guardian Glass LLC
    - b. Pilkington North America; NSG Group
    - c. Saint-Gobain Glass Corp
    - d. Vitro Architectural Glass
- F. Ceramic-Coated Spandrel Glass: ASTM C1048, Type1, Condition B, Quality-Q3.

## 2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
  - 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. Kuraray America, Inc.
    - b. Pilkington North America; NSG Group
    - c. Saflex; Eastman
  - 2. Construction: Laminate glass with polyvinyl butyral interlayer, ionoplast interlayer, or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written instructions.
  - 3. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  - 4. Interlayer Color: Clear unless otherwise indicated.

## 2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
  - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.

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2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
  - 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) Saint-Gobain Glass Corp
    - 2) Technoform Glass Insulation North America
    - 3) Thermix; a brand of Ensinger USA
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.7 GLAZING SEALANTS

### A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.

### B. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. GE Construction Sealants; Momentive Performance Materials Inc.
  - b. Pecora Corporation
  - c. Sika Corporation
  - d. The Dow Chemical Company
  - e. Tremco Incorporated

## 2.8 GLAZING TAPES

- ### A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:



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1. AAMA 804.3 tape, where indicated.
  2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
  2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks:
1. EPDM or Silicone with Shore A durometer hardness of 85, plus or minus 5.
  2. Type recommended in writing by sealant or glass manufacturer.
- D. Spacers:
1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
  2. Type recommended in writing by sealant or glass manufacturer.
- E. Edge Blocks:
1. EPDM or Silicone with Shore A durometer hardness per manufacturer's written instructions.
  2. Type recommended in writing by sealant or glass manufacturer.
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Shatter Resistant Security Film: Clear 7 mill single play self-adhering security film.
1. Basis-of-Design Product: "3M Scotchshield Ultra Safety & Security Film," 3M Commercial Solutions.

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2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep systems.
  - 3. Minimum required face and edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

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- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch-minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

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- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

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### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.8 MONOLITHIC GLASS SCHEDULE

- A. Low-Iron Glass Type : Fully tempered float glass.
  - 1. Minimum Thickness: 6 mm.
  - 2. Safety glazing required.
- B. Tinted Glass Type : Fully tempered float glass.
  - 1. Tint Color: Gray.
  - 2. Minimum Thickness: 6 mm.

### 3.9 LAMINATED GLASS SCHEDULE

- A. Clear Laminated Glass Type : Two plies of low-iron annealed float glass.
  - 1. Minimum Thickness of Each Glass Ply: 3 mm.
  - 2. Interlayer Thickness: 0.030 inch.
  - 3. Safety glazing required.

### 3.10 INSULATING GLASS SCHEDULE

- A. Ceramic-Coated, Low-E, Insulating Glass Type:
  - 1. Coating Color: As selected by Architect from manufacturer's full range.
  - 2. Overall Unit Thickness: 1 inch.
  - 3. Minimum Thickness of Each Glass Lite: 6 mm.
  - 4. Outdoor Lite: Clear fully tempered float glass.
  - 5. Interspace Content: Argon.
  - 6. Indoor Lite: Clear fully tempered float glass.
  - 7. Low-E Coating: Pyrolytic or sputtered on second or third surface.
  - 8. Opaque Coating Location: Fourth Surface.

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3.11 INSULATING-LAMINATED-GLASS SCHEDULE

A. Low-E-Coated, Tinted, Insulating Laminated Glass Type :

1. Overall Unit Thickness: 1 inch.
2. Minimum Thickness of Outdoor Lite: 6 mm.
3. Outdoor Lite: Tinted fully tempered float glass.
4. Tint Color: Gray.
5. Interspace Content: Argon.
6. Indoor Lite: Clear laminated glass with two plies of low-iron annealed float glass.
  - a. Minimum Thickness of Each Glass Ply: 3 mm.
  - b. Interlayer Thickness: 0.030 inch.
7. Low-E Coating: Pyrolytic or sputtered on second or third surface.
8. Winter Nighttime U-Factor: 0.31 maximum.
9. Summer Daytime U-Factor: 0.29 maximum.
10. Visible Light Transmittance: 65 percent minimum.
11. SGHC: 0.39 maximum.
12. Safety glazing required.

END OF SECTION

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SECTION 088853 - SECURITY GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
  - 1. Laminated-glass security glazing
  - 2. Insulating security glazing.
- B. Related Requirements:
  - 1. Section 085653 "Security Windows."

1.2 DEFINITIONS

- A. Glazing Manufacturers: Firms that produce primary glass, monolithic plastic glazing, or fabricated security glazing, as defined in referenced glazing publications.
- B. Interspace: Space between lites of air-gap security glazing or insulating security glazing.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on security glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of glass tint.
- D. Security Glazing Schedule: List security glazing types and thicknesses for each size opening and location. Use same designations indicated on Drawings. Indicate coordinated dimensions of security glazing and construction that receives security glazing, including clearances and glazing channel dimensions.
- E. Delegated Design Submittal: For security glazing, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

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1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Test and Evaluation Reports:
  - 1. Product Test Reports:
    - a. For each type of security glazing, for tests performed by qualified testing agency or manufacturer and witnessed by a qualified testing agency.
    - b. For each type of glazing sealant, for tests performed by a qualified testing agency.
      - 1) Provide test reports based on testing current sealant formulations within previous 36-month period.
- C. Qualification Statements: For installers, manufacturers of insulating security glazing with sputter-coated, low-e coatings, and glazing testing agency.
- D. Delegated design engineer qualifications.
- E. Sample warranties.

1.6 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturers: For insulating security glazing units with sputter-coated, low-e coatings, a qualified insulating glazing manufacturer who is approved by coated-glass manufacturer.
  - 2. Installers: Entity that employs installers and supervisors who are trained and approved by manufacturer.
  - 3. Delegated Design Engineer: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of type indicated.
  - 4. Security Glazing Testing Agency: Subject to compliance with requirements, testing agency is one of the following:
    - a. Intertek.
    - b. Underwriters Laboratories, Inc.
    - c. Wiss, Janney, Elstner Associates, Inc.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect security glazing and glazing materials according to manufacturer's written instructions. Prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating security glazing manufacturers' written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.



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1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.9 WARRANTY

- A. Special Warranty, Coated Glass: Manufacturer agrees to replace coated glass that fails in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Defects developed in coated glass from normal use that is not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Warranty, Laminated-Glass Security Glazing: Manufacturer agrees to replace laminated-glass security glazing that fails in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated-glass security glazing contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
  - 2. Warranty Period: 10 years from date of Substantial Completion.
- C. Special Warranty, Glass-Clad Polycarbonate Security Glazing: Manufacturer agrees to replace glass-clad polycarbonate security glazing that fails in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning glass-clad polycarbonate security glazing contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced polycarbonate standard, yellowing, and loss of light transmission.
  - 2. Warranty Period: 10 years from date of Substantial Completion.

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- D. Special Warranty, Laminated-Glass and -Polycarbonate Security Glazing: Manufacturer agrees to replace laminated-glass and -polycarbonate security glazing that fails in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
  - 2. Defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated-glass and -polycarbonate security glazing contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced polycarbonate standard, yellowing, and loss of light transmission.
  - 3. Warranty Period: 10 years from date of Substantial Completion.
- E. Special Warranty, Insulating Security Glazing: Manufacturer agrees to replace insulating security glazing that fails in materials and workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Defects in individual lites developed from normal use or failure of hermetic seal under normal use. Defects in individual lites or failure of hermetic seal that is attributed to glass breakage or to maintaining and cleaning insulating security glazing contrary to manufacturer's written instructions are not included.
    - b. Defects in coated-glass lites include peeling, cracking, and other indications of deterioration in coating.
    - c. Defects in laminated-glass lites include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
    - d. Defects in glass-clad polycarbonate lites include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.
    - e. Evidence of hermetic seal failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glazing.
  - 2. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain each type of security glazing from single source from single manufacturer.
  - 1. Obtain tinted and coated glass from single source from single manufacturer.
- B. Obtain glazing sealants and gaskets from single source from single manufacturer for each product and installation method.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General:

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1. Installed security glazing will withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
  2. Installed security glazing will withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design security glazing.
- C. Structural Performance: Glazing will withstand the following design loads within limits and under conditions indicated.
1. Design Procedure for Glass: ASTM E1300 and the IBC.
  2. Design Wind Pressures: As indicated on Drawings.
    - a. Wind Design Data: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
- E. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- F. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

### 2.3 SECURITY GLAZING, GENERAL

- A. Glazing Publications: Comply with published recommendations of security glazing and glazing material manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. AAMA Publications: AAMA GDSG-1 and AAMA TIR-A7.
  2. IGMA Publication for Insulating Glass: SIGMA TM-3000.
  3. NGA Publications: "Laminated Glazing Reference Manual" and "GANA Glazing Manual."
- B. Plastic Glazing Labeling: Identify plastic sheets with appropriate markings of applicable testing and inspecting agency, indicating compliance with required fire-test-response characteristics.
- C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label will indicate manufacturer's name, type of glazing, glass thickness, and safety glazing standard with which glazing complies.
- D. Insulating Glazing Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.
- E. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

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- F. Fire-Test-Response Characteristics of Polycarbonate Sheets: As determined by testing polycarbonate sheets identical to those used in security glazing products by a qualified testing agency acceptable to authorities having jurisdiction.
  - 1. Self-ignition temperature of 650 deg F or more when tested in accordance with ASTM D1929 on plastic sheets in thicknesses indicated for the Work.
  - 2. Smoke-Developed Index of 450 or less when tested in accordance with ASTM E84 or UL 723, or smoke density of 75 or less when tested in accordance with ASTM D2843 on plastic sheets in thicknesses indicated for the Work.
  - 3. Burning extent of 1 inch or less when tested in accordance with ASTM D635 at a nominal thickness of 0.060 inch or thickness indicated for the Work.
- G. Thermal and Optical Performance Properties: Provide security glazing with performance properties specified, as indicated in manufacturer's published test data, based on construction products indicated and on procedures indicated below:
  - 1. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F.
  - 2. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW 7.7 computer program.
  - 3. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

## 2.4 GLASS PRODUCTS

- A. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
  - 2. For fully tempered float glass, comply with requirements for Kind FT.
  - 3. For uncoated glass, comply with requirements for Condition A.
  - 4. For coated vision glass, comply with requirements for Condition C (other coated glass).
- C. Fire-Protection-Rated Film-Faced Ceramic Glazing: Clear ceramic flat glass; 5 mm thickness; faced on one surface with a clear glazing film; complying with 16 CFR 1201, Category II.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. McGrory Glass, Inc.
    - b. Schott North America, Inc.
    - c. Technical Glass Products; an Allegion brand.
    - d. Vetrotech Saint-Gobain.

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2.5 LAMINATED-GLASS SECURITY GLAZING

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide product manufactured by Total Security Solutions, or comparable product.
- B. Laminated-Glass Security Glazing: ASTM C1172. Two or more glass lites bonded with interlayer. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
  - 1. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  - 2. Interlayer Color: Clear unless otherwise indicated.

2.6 POLYCARBONATE SECURITY GLAZING

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide product manufactured by Total Security Solutions, or comparable product.
- B. Laminated Glass and Polycarbonate: ASTM C1349. Two or more glass lites and polycarbonate bonded with interlayer. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

2.7 INSULATING SECURITY GLAZING

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide product manufactured by Total Security Solutions, or comparable product.
- B. Insulating Security Glazing: Factory-assembled units, consisting of sealed lites of glazing material indicated separated by a dehydrated interspace, qualified in accordance with ASTM E2190
  - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
  - 2. Spacer: Manufacturer's standard spacer material and construction.
  - 3. Desiccant: Molecular sieve or silica gel, or blend of both.

2.8 INSULATING SECURITY GLAZING (INTERIOR)

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide "Pilkington Pyrostop BR"; Pilkington, Technical Glass Products; an Allegion brand, or comparable product.
- B. Insulating Security Glazing: Factory-assembled units, consisting of sealed lites of glazing material indicated separated by a dehydrated interspace, qualified in accordance with ASTM E2190
  - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
  - 2. Spacer: Manufacturer's standard spacer material and construction.
  - 3. Desiccant: Molecular sieve or silica gel, or blend of both.

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C. Performance Requirements:

1. Fire Performance: NFPA 80 and UL 263.
  - a. Fire Resistance (Walls and Windows): 120 minutes.
2. Bullet Resistance: UL 752; Level 3.

2.9 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they contact, including security glazing, seals of insulating security glazing and air-gap security glazing, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and security glazing manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of Industry colors.

B. Glazing Sealant:

1. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) GE Construction Sealants; Momentive Performance Materials Inc.
    - 2) Pecora Corporation
    - 3) Sika Corporation
    - 4) The Dow Chemical Company
    - 5) Tremco Incorporated

2.10 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and security glazing manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

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1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.11 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of security glazing and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks:
1. EPDM or Silicone with Shore A durometer hardness of 85, plus or minus 5.
  2. Type recommended in writing by sealant or glass manufacturer.
- D. Spacers:
1. Neoprene blocks or continuous extrusions of hardness required by security glazing manufacturer to maintain security glazing lites in place for installation indicated.
  2. Type recommended in writing by sealant or security glazing manufacturer.
- E. Edge Blocks:
1. EPDM or Silicone with Shore A durometer hardness in accordance with manufacturer's written instructions.
  2. Type recommended in writing by sealant or security glazing manufacturer.
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.12 FABRICATION OF SECURITY GLAZING

- A. Fabricate security glazing in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Grind smooth and polish exposed security glazing edges and corners.



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing for security glazing, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep system.
  - 3. Minimum required face or edge clearances.
  - 4. Minimum required bite.
  - 5. Effective sealing between joints of framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving security glazing immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of security glazing, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect edges of security glazing from damage during handling and installation. Remove damaged security glazing from Project site and legally dispose of it off Project site. Damaged security glazing includes units with edge or face damage or other imperfections that, when installed, could weaken security glazing and impair performance and appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by security glazing manufacturers for installing lites.
- F. Provide spacers for security glazing lites where the length plus width is larger than 50 inches.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of security glazing. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with performance requirements.



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2. Provide 1/8-inch minimum bite of spacers on glazing lites and use thickness equal to sealant width. With glazing tape, use thickness of slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent security glazing from moving sideways in glazing channel, as recommended in writing by security glazing manufacturer and in accordance with requirements in referenced glazing publications.
- H. Set security glazing in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set coated security glazing with proper orientation so that coatings and films face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by security glazing, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center security glazing in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended in writing by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

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- B. Insert soft compression gasket between glazing unit and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center security glazing in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center security glazing in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between security glazing and glazing stops to maintain face clearances and to prevent sealant from extruding into glazing channel and blocking weep systems. Secure spacers, or spacers and backings, in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to security glazing and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from security glazing.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect security glazing from contact with contaminating substances resulting from construction operations, including weld splatter. Examine security glazing surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do contact with security glazing, remove substances immediately as recommended in writing by security glazing manufacturer. Remove and replace security glazing that cannot be cleaned without damage.
- C. Wash security glazing on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash security glazing as recommended in writing by security glazing manufacturer.

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### 3.8 LAMINATED-GLASS SECURITY GLAZING SCHEDULE

- A. Security Glazing (Security Window): Clear laminated glass.
1. Ballistic Resistance, ASTM F1233: HG1 - Handgun-Low.
  2. Maximum Overall Unit Thickness: 1/2-inch.
  3. Number of Plies: Two.
  4. Makeup:
    - a. Outer Ply (Threat Side): 6 mm annealed float glass.
      - 1) Interlayer Thickness: 0.45 inch.
    - b. Inner Ply: 6 mm annealed float glass.
- B. Security Glazing (Interior Non-Rated Ballistic Doors and Windows): Clear laminated glass.
1. Basis-of-Design Product: TSS 003 LS No Poly 1-1/4-inch; Total Security Solutions.
  2. Ballistic Resistance, UL 752: Level 3 in accordance with UL 752.
  3. Maximum Overall Unit Thickness: 1-1/4 inch.
  4. Number of Plies: Four.
  5. Makeup:
    - a. Outer Ply (Threat Side): 6 mm annealed float glass.
      - 1) Interlayer Thickness: 0.45 inch.
    - b. Core Ply: 6 mm annealed float glass.
      - 1) Interlayer Thickness: 0.30 inch.
    - c. Core Ply: 6 mm annealed float glass.
      - 1) Interlayer Thickness: 0.150 inch.
    - d. Outer Ply (Secure Side): 5 mm annealed float glass.

### 3.9 LAMINATED-GLASS AND -POLYCARBONATE SECURITY GLAZING SCHEDULE

- A. Security Glazing (Interior Rated Ballistic Doors and Windows): Nonsymmetrical clear laminated glass and polycarbonate with glass plies on the attack or threat side and polycarbonate plies on the witness side.
1. Basis-of-Design Product: TSS 003 LS 1-3/16-inch (90 Minute Glazing); Total Security Solutions.
  2. Ballistic Resistance, UL 752: Level 3.
  3. Maximum Overall Unit Thickness: 1-3/16 inch.
  4. Makeup:
    - a. Outer Glass Ply (Threat Side): 6 mm film-faced ceramic glass (90 minute rating).

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- 1) Interlayer Thickness: 0.025 inch.
- b. Inner Glass Ply: 12 mm annealed float glass.
  - 1) Interlayer Thickness: 0.050 inch.
- c. Inner Polycarbonate Ply: 0.125 inch, Type I (standard, UV-stabilized) polycarbonate.
  - 1) Interlayer Thickness: 0.050 inch.
- d. Outer Glass Ply: 5 mm annealed float glass.

### 3.10 INSULATING SECURITY GLAZING SCHEDULE

- A. Security Glazing (Exterior Ballistic Storefronts): Tinted insulating security glazing. Outdoor and indoor lites are made of laminated glass.
  - 1. Basis-of-Design Product: TSS 003 L/S IGU No Poly 1-1/2-inch; Total Security Solutions.
  - 2. Ballistic Resistance, UL 752: Level 3.
  - 3. Overall Unit Thickness: 1-1/2 inch.
  - 4. Outdoor Lite (Threat Side): Laminated glass with two plies of annealed float glass.
    - a. Outer Ply: 6 mm annealed float glass.
      - 1) Interlayer Thickness: 0.030 inch.
    - b. Inner Ply: 6 mm annealed float glass.
  - 5. Indoor Lite: Laminated glass with three plies of annealed float glass.
  - 6. Interspace Content: Argon.
  - 7. Interspace Dimension: 5/16 inch.
  - 8. Glass Tint Color: Gray.
  - 9. Tinted Glass Location: Outer ply of outdoor lite.
  - 10. Low-E Coating: Oxyolytic or Sputtered on the second surface.
  - 11. Visible Light Transmittance: 65 percent minimum.
  - 12. Winter Nighttime U-Factor: 0.31 maximum.
  - 13. Summer Daytime U-Factor: 0.29 maximum.
  - 14. Solar-Heat-Gain Coefficient: 0.39 maximum.
- B. Security Glazing (Interior Rated Borrowed Lite): Clear insulating security glazing multi-laminated construction.
  - 1. Basis-of-Design Product: Pilkington Pyrostop BR 120 (with film); Pilkington, Technical Glass Products; an Allegion brand.
  - 2. Ballistic Resistance, UL 752: Level 3.
  - 3. Fire Performance: ASTM E119 and UL 263.
    - a. Fire Resistance (Walls and Windows): 120 minutes.

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4. Overall Unit Thickness: 2-7/16 inch.
5. Construction: Multi-laminate with intumescent interlayer.

END OF SECTION

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SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each component of gypsum board shaft wall assemblies.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Evaluation Reports: From an agency acceptable to authorities having jurisdiction showing compliance with Project requirements, for the following:
  1. Studs and track.
  2. Equivalent corrosion-resistant coating on steel framing.
  3. Firestop track.
  4. Post-installed anchors.
  5. Power-actuated fasteners.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage.
- B. Stack shaftliner and face panels flat and support them on risers on a flat platform to prevent sagging.
- C. Protect steel framing from corrosion, deformation, and other damage during delivery, storage, and handling in accordance with AISI S202.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.

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- B. Do not install finish panels until installation areas are enclosed and conditioned.
- C. Do not install shaftliner and face panels that are wet, moisture damaged, or mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to rated assembly indicated on Drawings tested in accordance with ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: Provide materials and construction identical to rated assembly indicated on Drawings tested in accordance with ASTM E90 and classified in accordance with ASTM E413 by a testing and inspecting agency.

### 2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated on Drawings.
- B. Minimum STC Rating: As indicated on Drawings.
- C. Gypsum Shaftliner Board:
  - 1. Moisture- and Mold-Resistant Type X: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with ASTM D3273 mold-resistance score of 10 rated in accordance with ASTM D3274, 1 inch thick, and with double beveled long edges.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) American Gypsum
      - 2) CertainTeed; SAINT-GOBAIN
      - 3) Gold Bond Building Products, LLC provided by National Gypsum Company
      - 4) USG Corporation
- D. Steel Framing, General: Complying with applicable requirements in AISI S220 and complying with requirements for fire-resistance-rated assemblies indicated on Drawings.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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- a. ClarkDietrich
    - b. Marino\WARE
    - c. SCAFCO Steel Stud Company; Stone Group of Companies
    - d. Steel Construction Systems; Stone Group of Companies
  - 2. Protective Coating: ASTM A653/A653M, G40 or coating with demonstrated equivalent corrosion resistance. Galvannealed products are unacceptable.
    - a. Equivalent Corrosion Resistance: Evaluation report acceptable to authorities having jurisdiction demonstrates corrosion resistance equivalent to specified protective coating.
  - E. Studs: Profiles required for fire-resistance-rated assembly indicated on Drawings for repetitive, corner, and end members as follows:
    - 1. Depth: As indicated on Drawings.
    - 2. Minimum Base-Steel Thickness: 0.0179 inch.
  - F. Track: J-profile track required for fire-resistance-rated assembly indicated on Drawings with minimum long-leg length of 2 inches and matching studs in depth.
    - 1. Minimum Base-Steel Thickness: 0.0179 inch.
  - G. Firestop Track: Deep top track manufactured to allow shaft wall heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated on Drawings; in base-steel thickness not less than that of studs and in width required to comply with requirements of fire-rated assembly.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. ClarkDietrich
      - b. Fire Trak Corp
  - H. Finish Panels: Gypsum board as specified in Section 092900 "Gypsum Board."
  - I. Sound Attenuation Blankets: As specified in Section 092900 "Gypsum Board."
- 2.3 ACCESSORIES
- A. Provide accessories that comply with shaft wall manufacturer's written instructions.
  - B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with shaft wall assembly manufacturer's written instructions for application indicated on Drawings.
  - C. Steel Drill Screws: ASTM C1002 unless otherwise indicated on Drawings.
  - D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.



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1. Expansion Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES, AC01, or AC193 as appropriate for the substrate.
  2. Power-Actuated Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Reinforcing: Steel reinforcing strips of corrosion-resistant steel complying with steel framing requirements and in 0.0329-inch minimum base-steel thickness.
- F. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine shaftliner and face panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Coordination with Sprayed Fire-Resistive Materials:
  1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or top track to surfaces indicated to receive sprayed fire-resistive materials unless otherwise indicated on Drawings. Where offset anchor plates are required, provide continuous plates fastened to building structure as required by fire-resistance-rated assembly but not more than 24 inches o.c.
  2. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated on Drawings. Protect remaining fire-resistive materials from damage.
  3. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fire Protection."

#### 3.3 INSTALLATION OF GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. General: Install shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated on Drawings and manufacturer's written installation instructions.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

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- C. Install supplementary framing in shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
  - 1. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.
- D. Penetrations: At penetrations in shaft wall assemblies, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.
- F. Firestop Track: Where indicated on Drawings, install to maintain continuity of fire-resistance-rated assembly.
- G. Control Joints: Install control joints in accordance with ASTM C840 and in specific locations approved by Architect while maintaining fire-resistance rating of shaft wall assemblies.
- H. Sound-Rated Shaft Wall Assemblies: Seal with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.
- I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

### 3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace shaftliner and face panels that are wet, moisture damaged, or mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonstructural steel framing.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior loadbearing, structural framing.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product.

C. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of nonstructural steel framing and fastening and anchorage details.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, and attachments to adjoining work.

1.3 INFORMATIONAL SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Certificates: For code-compliance certification of studs and track.

C. Evaluation Reports: From an agency acceptable to authorities having jurisdiction showing compliance with Project requirements, for the following:

1. Studs and track.
2. High-strength steel studs and track.
3. Equivalent corrosion-resistant coating on steel framing.
4. Firestop track.
5. Post-installed anchors.
6. Power-actuated fasteners.

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1.4 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Track: Provide documentation that framing members are certified in accordance with product-certification program of the Steel Framing Industry Association, the Steel Stud Manufacturers Association, or the Supreme Steel Framing System Association.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Protect materials from corrosion, deformation, and other damage during delivery, storage, and handling in accordance with AISI S202.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Where indicated on Drawings, provide assemblies incorporating nonstructural steel framing identical to those of assemblies tested for fire resistance in accordance with ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: Where indicated on Drawings, provide assemblies incorporating nonstructural framing identical to those of assemblies tested in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.
- C. Horizontal Deflection: For composite and non-composite wall assemblies, limited to 1/240 of the wall height based on the following horizontal loading:
  - 1. Horizontal Loading: 5 lbf/sq. ft.

2.2 NONSTRUCTURAL STEEL FRAMING

- A. Framing Members, General: Comply with requirements in AISI S220 for conditions indicated on Drawings.
  - 1. Protective Coating: ASTM A653/A653M, G40 or coating with demonstrated equivalent corrosion resistance. Galvannealed products are unacceptable.
    - a. Equivalent Corrosion-Resistant Coating: Evaluation report acceptable to authorities having jurisdiction demonstrates corrosion resistance equivalent to specified protective coating.
- B. Studs and Track: Conventional members, roll-formed into standard shapes without surface deformations to stiffen framing members.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich
    - b. Marino\WARE
    - c. MBA Metal Framing
    - d. MRI Steel Framing, LLC
    - e. SCAFCO Steel Stud Company; Stone Group of Companies
    - f. Steel Construction Systems; Stone Group of Companies
  2. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
  3. Minimum Yield Strength: 33 ksi.
  4. Depth: As indicated on Drawings.
- C. High-Strength Steel Studs and Track: Roll-formed into proprietary shapes incorporating ribs, embossment, knurling, or dimensional changes to stiffen framing members.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich
    - b. Marino\WARE
    - c. MBA Metal Framing
    - d. MRI Steel Framing, LLC
    - e. SCAFCO Steel Stud Company; Stone Group of Companies
    - f. Steel Construction Systems; Stone Group of Companies
  2. Minimum Base-Steel Thickness and Yield Strength: As required by horizontal deflection performance requirements.
  3. Depth: As indicated on Drawings.
- D. Slip-Type Head Joints: Where indicated on Drawings, provide one of the following:
1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to track while allowing 1-1/2-inch minimum vertical movement.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) ClarkDietrich
      - 2) Marino\WARE
      - 3) MBA Metal Framing
      - 4) SCAFCO Steel Stud Company; Stone Group of Companies
      - 5) Steel Construction Systems; Stone Group of Companies
  2. Single Long-Leg Track: Top track with solid, 2-inch-deep flanges in base-steel thickness not less than that of studs, installed with studs friction fit into track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

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- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) ClarkDietrich
  - 2) Marino\WARE
  - 3) MRI Steel Framing, LLC
  - 4) SCAFCO Steel Stud Company; Stone Group of Companies
  - 5) Steel Construction Systems; Stone Group of Companies
  - 6) Steel Network, Inc. (The)
  
3. Slotted Deflection Track: Steel sheet top track manufactured with 2-1/2-inch-deep flanges that allow positive attachment to studs through long slots and prevent deflection of structure above from cracking finishes applied to framing; in base-steel thickness not less than that of studs and in width to accommodate depth of studs.
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) ClarkDietrich
    - 2) Marino\WARE
    - 3) MRI Steel Framing, LLC
    - 4) SCAFCO Steel Stud Company; Stone Group of Companies
    - 5) Steel Construction Systems; Stone Group of Companies
  
4. Double-Track System: Top outer track sized to friction-fit over inner track and inner track with 2-inch- deep flanges in base-steel thickness not less than that of studs and fastened to studs.
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) ClarkDietrich
    - 2) SCAFCO Steel Stud Company; Stone Group of Companies
    - 3) Steel Construction Systems; Stone Group of Companies
  
- E. Firestop Track: Top track manufactured to allow partition heads to expand and contract with movement of structure above while maintaining continuity of fire-resistance-rated assembly indicated on Drawings; in base-steel thickness not less than that of studs and in width to accommodate depth of studs.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich
    - b. Fire Trak Corp
    - c. Marino\WARE
    - d. Metal-Lite
    - e. SCAFCO Steel Stud Company; Stone Group of Companies
    - f. Steel Construction Systems; Stone Group of Companies

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- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated on Drawings.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich
    - b. Marino\WARE
    - c. MBA Building Supplies
    - d. MRI Steel Framing, LLC
    - e. Phillips Manufacturing Co
    - f. SCAFCO Steel Stud Company; Stone Group of Companies
    - g. Steel Construction Systems; Stone Group of Companies
  2. Minimum Base-Steel Thickness: 0.0269 inch.
- G. U-Channel: Cold-rolled steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch-wide flanges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich
    - b. Marino\WARE
    - c. MRI Steel Framing, LLC
    - d. SCAFCO Steel Stud Company; Stone Group of Companies
    - e. Steel Construction Systems; Stone Group of Companies
  2. Depth:
    - a. Bridging: As indicated on Drawings.
  3. Bridging Clip Angle: Not less than 1-1/2 by 1-1/2 inches; 0.068-inch-base-steel thickness.
- H. Rigid Hat-Shaped Furring Channels:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich
    - b. Marino\WARE
    - c. MRI Steel Framing, LLC
    - d. Phillips Manufacturing Co
    - e. SCAFCO Steel Stud Company; Stone Group of Companies
    - f. Steel Construction Systems; Stone Group of Companies
  2. Minimum Base-Steel Thickness: 0.0179 inch.
  3. Depth: As indicated on Drawings.

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- I. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich
    - b. Marino\WARE
    - c. MRI Steel Framing, LLC
    - d. SCAFCO Steel Stud Company; Stone Group of Companies
    - e. Steel Construction Systems; Stone Group of Companies
  - 2. Configuration: Asymmetrical or hat shaped.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 3/4 inch, minimum base-steel thickness of 0.0179 inch, and depth thickness indicated on Drawings.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ClarkDietrich
    - b. Marino\WARE
    - c. MRI Steel Framing, LLC
    - d. Phillips Manufacturing Co
    - e. SCAFCO Steel Stud Company; Stone Group of Companies
    - f. Steel Construction Systems; Stone Group of Companies

## 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Power-Actuated Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Isolation Strip at Exterior Walls: Provide[ one of] the following:
  - 1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
  - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, substrates, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination with Sprayed Fire-Resistive Materials:
  - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling track to surfaces indicated on Drawings to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
  - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of nonstructural steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated on Drawings. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION OF NONSTRUCTURAL METAL FRAMING, GENERAL

- A. Installation Standard: ASTM C754.
  - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with framing members. Frame both sides of joints independently.

3.4 INSTALLATION OF NONSTRUCTURAL STEEL FRAMING

- A. Install framing system components at spacings indicated on Drawings, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated on Drawings.
  - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated on Drawings.

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- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install track at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated on Drawings to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated on Drawings.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated on Drawings. Install framing below sills of openings to match framing required above door heads.
  - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated on Drawings and support closures to make partitions continuous from floor to underside of solid structure.
    - a. Firestop Track: Install to maintain continuity of fire-resistance-rated assembly indicated on Drawings.
  - 5. STC-Rated Partitions: Install framing to comply with STC-rated assembly indicated on Drawings.
  - 6. Curved Partitions:
    - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of at least two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
  - 1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Z-Shaped Furring Members: As indicated on Drawings.
- G. Installation Tolerances for Nonstructural Steel Framing:
  - 1. Framing Members: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION

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SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Ballistic resistant panels.
3. Trim accessories.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for steel shaft wall framing, gypsum shaft liners, and other components of shaft wall assemblies.
3. Section 092216 "Non-Structural Metal Framing" for nonstructural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product.

C. Shop Drawings:

1. Locations and installation of control and expansion joints, including plans, elevations, sections, and attachment details.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

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- C. Do not install panels that are wet, moisture damaged, or mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings in accordance with ASTM E119; tested by a qualified testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings in accordance with ASTM E90 and classified in accordance with ASTM E413; tested by a qualified testing agency.
- C. Verify ceiling and wall materials comply with requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 16.5 mcg/cu. m or 13.5 ppb, whichever is less.

### 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C1396/C1396M.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Gypsum
    - b. CertainTeed; SAINT-GOBAIN
    - c. Georgia-Pacific Gypsum LLC
    - d. Gold Bond Building Products, LLC provided by National Gypsum Company
    - e. USG Corporation
  - 2. Thickness: As indicated on Drawings.
  - 3. Long Edges: Tapered.
- B. Flexible Gypsum Board: ASTM C1396/C1396M; manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Gold Bond Building Products, LLC provided by National Gypsum Company
  - b. USG Corporation
2. Core: As indicated on Drawings.
3. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Gypsum
  - b. CertainTeed; SAINT-GOBAIN
  - c. Georgia-Pacific Gypsum LLC
  - d. Gold Bond Building Products, LLC provided by National Gypsum Company
  - e. USG Corporation
2. Thickness: As indicated on Drawings.
3. Long Edges: Tapered.

D. Mold-Resistant Gypsum Board: ASTM C1396/C1396M; manufactured with moisture- and mold-resistant core and paper surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Gypsum
  - b. CertainTeed; SAINT-GOBAIN
  - c. Georgia-Pacific Gypsum LLC
  - d. Gold Bond Building Products, LLC provided by National Gypsum Company
  - e. USG Corporation
2. Core: As indicated on Drawings.
3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
4. Long Edges: Tapered.

2.4 BALLISTIC RESISTANT PANELS

A. High-pressure molded laminated fiberglass and resin panel. UL 752 Bullet Resistant Equipment, Level 3.

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. INSULGUARD Security Products.
  - b. Total Security Solutions.

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2. Thickness: Manufacturers standard thickness to meet Level 3 UL752 requirements but no greater than 5/8 inch.

## 2.5 TRIM ACCESSORIES

### A. Interior Trim: ASTM C1047.

1. Material: Galvanized-steel sheet or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
  - a. Cornerbead.
  - b. Bullnose bead.
  - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
  - d. L-Bead: L-shaped; exposed long flange receives joint compound.
  - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
  - f. Expansion (control) joint.
  - g. Curved-Edge Cornerbead: With notched or flexible flanges.

## 2.6 JOINT TREATMENT MATERIALS

### A. General: Comply with ASTM C475/C475M requirements.

1. Mold-Resistant Joint Compound: Use mold-resistant formulations with mold-resistant panel products.

### B. Joint Tape:

1. Interior Gypsum Board: Paper.

### C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
  - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

## 2.7 AUXILIARY MATERIALS

### A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

### B. Steel Drill Screws: ASTM C1002 unless otherwise specified or indicated on Drawings.

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1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers as follows:
  1. Non-Fire-Resistance-Rated Assemblies: Slag or rock wool.
  2. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840 requirements.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch of** open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

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1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  2. Fit gypsum panels around ducts, pipes, and conduits.
  3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 requirements and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound-attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
1. Gypsum Board, Type X: As indicated on Drawings.
  2. Flexible Gypsum Board: As indicated on Drawings.
  3. Gypsum Ceiling Board: Ceiling surfaces.
  4. Mold-Resistant Gypsum Board: As indicated on Drawings.
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated on Drawings.
  2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise specified or indicated on Drawings or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated on Drawings or required by fire-resistance-rated assembly.



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3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated on Drawings or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over studs or furring members and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated on Drawings or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

### 3.4 INSTALLATION OF BALLISTIC RESISTANT PANELS

- A. Install ballistic resistant panels in locations indicated on Drawings per manufacturer's written instructions. Install panels vertically (parallel to framing) and stagger butt end joints between studs. Install batten strips behind butt joints of panels.

### 3.5 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim in accordance with manufacturer's written instructions.
- B. Control Joints: Install control joints in accordance with ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:

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1. Cornerbead: Install at outside corners unless otherwise specified or indicated on Drawings.
2. LC-Bead: Install at exposed panel edges.
3. L-Bead: Install where indicated on Drawings.
4. U-Bead: Install where indicated on Drawings.
5. Curved-Edge Cornerbead: Install at curved openings.

### 3.6 APPLICATION OF JOINT TREATMENT MATERIALS

- A. Finishing Panel Products: Treat joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare panel surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over panel joints, except for trim products specifically indicated as not intended to receive tape.
- D. Interior Gypsum Board: Finish panels to levels indicated below and in accordance with ASTM C840:
  1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  2. Level 2: Panels that are substrate for tile.
  3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

### 3.7 PROTECTION

- A. Protect adjacent surfaces from joint compound and promptly remove from floors and other non-gypsum board surfaces. Repair surfaces stained, marred, or otherwise damaged during gypsum board installation and finishing.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

END OF SECTION

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SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Glazed wall tile.
3. Setting material.
4. Grout materials.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of movement joints in tile surfaces.

1.2 DEFINITIONS

- A. General: Definitions in ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Face Size: Actual tile size, excluding spacer lugs.
- C. Module Size: Actual tile size plus joint width indicated.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Shop Drawings: Show locations, plans, and elevations, of each type of tile and tile pattern. Show widths, details, and locations of movement joints in tile substrates and finished tile surfaces.
- D. Samples for Initial Selection: For tile, grout, and accessories involving color selection or shade variation.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer.

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1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.8 WARRANTY

- A. System Warranty: Manufacturer's non-prorated comprehensive warranty that agrees to repair and replace defective installation areas, material, and labor that fail under normal usage within specified warranty period.
  - 1. Warranty Period: Five years from date of Product Purchase.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Tile: Obtain tile of each type from single source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

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- B. Tiling System: Obtain system products from single manufacturer and each aggregate from single source or producer.
  - 1. Obtain setting and grouting materials, except for unmodified portland cement and aggregate, from single manufacturer.
  - 2. Obtain underlayment from manufacturer of setting and grouting materials.
  - 3. Obtain waterproof membrane, crack isolation, and other required membranes from manufacturer of setting and grouting materials.
  - 4. Obtain joint sealants from manufacturer of setting and grouting materials.

## 2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard Grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

## 2.3 PORCELAIN TILE

- A. Porcelain Tile Type: Unglazed.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Olean; a brand of Dal-Tile Corporation.
    - b. Crossville, Inc.
    - c. Daltile; a brand of Dal-Tile Corporation.
    - d. Florida Tile, Inc.
    - e. Florim USA.
    - f. Interceramic.
    - g. Iris Ceramics U.S., a division of Stonepeak Ceramics, Inc.
    - h. Marazzi USA; a brand of Dal-Tile Corporation.
    - i. Portobello America, Inc.
    - j. Vitromex USA, Inc.
  - 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
  - 3. Face Size: 12 inches by 24 inches.
  - 4. Face Size Variation: Rectified.
  - 5. Thickness: 5/16 inch.
  - 6. Physical Properties: Chemical resistant when tested with indicated chemicals in accordance with ASTM C650.
  - 7. Tile Color, Glaze, and Pattern: As selected by Architect from manufacturer's full range.

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8. Grout Color: As selected by Architect from manufacturer's full range.

## 2.4 GLAZED WALL TILE

### A. Glazed Wall Tile Type:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Olean; a brand of Dal-Tile Corporation.
  - b. Crossville, Inc.
  - c. Daltile; a brand of Dal-Tile Corporation.
  - d. Interceramic.
  - e. Jeffrey Court Inc.
  - f. Marazzi USA; a brand of Dal-Tile Corporation.
  - g. Vitromex USA, Inc.
2. Module Size: 3 inches by 6 inches.
3. Face Size Variation: Rectified.
4. Thickness: 5/16 inch.
5. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
6. Grout Color: As selected by Architect from manufacturer's full range.
7. Mounting:
  - a. Factory, back mounted.
8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. Base Cap: Coved, module size 3 by 6 inches.
  - b. Wainscot Cap: Bullnose cap, module size 3 by 6 inches.
  - c. External Corners for Thinset Mortar Installations: Surface bullnose; same size as adjoining flat tile.
  - d. Internal Corners: Field-buttet square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.

## 2.5 SETTING MATERIALS

### A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ARDEX Americas.
  - b. Boiardi Products Corporation; a QEP company.
  - c. Bostik; Arkema.
  - d. C-Cure.
  - e. Custom Building Products.
  - f. H.B. Fuller Construction Products Inc. / TEC.
  - g. Laticrete International, Inc.

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- h. [MAPEI Corporation.](#)
  - i. Parex, a Sika brand.
  - j. Schluter Systems L.P.
  - k. [Siena Tile & Stone Installation Products; Omega Products International.](#)
  - l. [Southern Grouts & Mortars, Inc.](#)
  - m. [Summitville Tiles, Inc.](#)
- 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
  - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.4.

## 2.6 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.
  - 1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
    - a. [ARDEX Americas.](#)
    - b. [Boiardi Products Corporation; a QEP company.](#)
    - c. [Bostik; Arkema.](#)
    - d. [C-Cure.](#)
    - e. [Custom Building Products.](#)
    - f. [H.B. Fuller Construction Products Inc. / TEC.](#)
    - g. [Laticrete International, Inc.](#)
    - h. [MAPEI Corporation.](#)
    - i. Parex, a Sika brand.
    - j. [Sika Corporation.](#)
    - k. [Southern Grouts & Mortars, Inc.](#)
    - l. [Summitville Tiles, Inc.](#)
  - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

## 2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting and adhesive materials for installations indicated.
- B. Metal Flooring Transitions: Profile designed specifically for flooring applications; height to match tile and setting-bed thickness.
  - 1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

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- a. Blanke Corporation.
  - b. Custom Building Products.
  - c. Dural USA, Inc.
  - d. Profilitec Corp.
  - e. Progress Profiles America Inc.
  - f. Schluter Systems L.P.
- 2. Description: L-shaped.
- 3. Material and Finish: Metallic or combination of metal and PVC or neoprene base; polished nickel anodized aluminum color-coated aluminum exposed-edge material.
  - a. Color: To be selected by Architect from manufacturer's full range.
- C. Metal Edge Trim: Profile designed for wall terminations and edge protection.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Blanke Corporation.
    - b. Custom Building Products.
    - c. Dural USA, Inc.
    - d. Profilitec Corp.
    - e. Progress Profiles America Inc.
    - f. Schluter Systems L.P.
  - 2. Description: L-shaped.
  - 3. Terminations: Inside corners matching edge-protection profile.
  - 4. Material and Finish: Polished nickel anodized aluminum Color-coated aluminum exposed-edge material.
    - a. Color: To be selected by Architect from manufacturer's full range.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.



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- a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
  - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
- 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
- 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove coatings, including curing compounds or other coatings, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions in concrete substrates for tile floors with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

### 3.3 INSTALLATION OF CERAMIC TILE SYSTEM

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
  - 1. Allow crack isolation membrane to cure before installing tile or setting materials over it.
- B. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
  - 1. Add materials, water, and additives in accurate proportions.
  - 2. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
- C. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 series that are referenced in TCNA installation methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.
  - 1. For the following installations, follow procedures in ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
    - a. Exterior tile floors and walls.
    - b. Tile floors in wet areas.
    - c. Tile swimming pool decks.
    - d. Tile floors in laundries.
    - e. Tile floors consisting of tiles 8 by 8 inches or larger.
    - f. Tile floors consisting of rib-backed tiles.

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2. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
  3. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
  4. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
  5. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
  6. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
    - a. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets, so joints between sheets are not apparent in finished Work.
    - b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
    - c. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
  7. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- D. Metal Flooring Transitions: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- E. Metal Wall Trim: Install at locations indicated on Drawings.

### 3.4 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  1. Remove grout residue from tile as soon as possible.
  2. Clean grout smears and haze from tile in accordance with tile and grout manufacturer's written instructions. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

### 3.5 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

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- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION

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SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
1. Acoustical panels.
  2. Metal suspension system.
  3. Metal edge moldings and trim.
- C. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Ceiling suspension-system members.
  2. Method of attaching hangers to building structure.
- C. Qualification Data: For testing agency.
- D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For finishes to include in maintenance manuals.

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## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
  - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

## 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Source Limitations for Ceiling System: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Smoke-Developed Index: 450 or less.

### 2.3 ACOUSTICAL PANELS (ACT-1 & 2)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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1. [American Gypsum.](#)
  2. [Cardinal Acoustics, Inc.](#)
  3. CertainTeed; SAINT-GOBAIN.
  4. [Rockfon; ROCKWOOL International.](#)
  5. [USG Corporation.](#)
- B. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
1. Type and Form, Type IV Form 1: Mineral base with membrane-faced overlay.
  2. Type and Form, Type IV Form 2: Mineral base with membrane-faced overlay.
  3. Pattern: E (lightly textured); G (smooth).
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.90.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.85.
- H. Edge/Joint Detail: Fineline Bevel.
- I. Thickness:
1. 7/8 inch.
- J. Modular Size: 24 by 24 inches.
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.

## 2.4 METAL SUSPENSION SYSTEM

- A. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
1. Armstrong Ceiling & Wall Solutions.
  2. Cardinal Acoustics, Inc.
  3. [CertainTeed; SAINT-GOBAIN.](#)
  4. Cipriani USA.
  5. [Rockfon; ROCKWOOL International.](#)
  6. [USG Corporation.](#)
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories in accordance with ASTM C635/C635M and designated by type, structural classification, and finish indicated.

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- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
  - 1. Structural Classification: Heavy-duty system.
  - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
  - 3. Face Design: Flat, flush.
  - 4. Cap Material: Cold-rolled steel or aluminum.
  - 5. Cap Finish: Painted white.
- D. Reveal Finline Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized G30 coating designation, with pre-finished 15/16 inch.

## 2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
  - 2. Stainless Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
  - 3. Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.
  - 4. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch-diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.
- F. Hold-Down Clips: Manufacturer's standard hold-down.

## 2.6 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong Ceiling & Wall Solutions.
  - 2. CertainTeed; SAINT-GOBAIN.
  - 3. Cipriani USA.
  - 4. Rockfon; ROCKWOOL International.
  - 5. USG Corporation.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with

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seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings to fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
  2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
  2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

#### 3.3 INSTALLATION OF ACOUSTICAL PANEL CEILINGS

- A. Install acoustical panel ceilings in accordance with ASTM C636/C636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:



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1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  8. Do not attach hangers to steel deck tabs.
  9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

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2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
3. Protect lighting fixtures and air ducts in accordance with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
  1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
  2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- B. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 095426 – SUSPENDED WOOD CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
  - 1. Suspended wood ceiling grille.
- B. Related Requirements:
  - 1. Section 095113, "Acoustical Panel Ceilings."
  - 2. Section 265119, "LED Interior Lighting."

1.3 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

1.4 COORDINATION

- A. Coordinate layout and installation of wood ceilings and suspension systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of the Construction Contract Clauses, Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.

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1. Include panel edge, core material, and mounting indicated.
- C. Shop Drawings: For unit assembly and installation.
  1. Include reflected ceiling plans, elevations, sections, and mounting devices and details.
  2. Include details at joints and corners; and details at ceiling intersections and intersections with walls. Indicate panel edge profile and core materials.
  3. Include direction of wood grain.
- D. Samples for Initial Selection: For each type of panel.
  1. Include Samples of hardware and accessories involving color or finish selection.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of the Construction Contract Clauses, Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  1. Wood ceiling patterns and joints.
  2. Suspended ceiling components above ceiling units.
  3. Structural members to which suspension devices will be attached.
  4. Items penetrating or covered by units including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Alarms.
    - e. Sprinklers.
  5. Show operation of hinged and sliding components covered by or adjacent to units.
- C. Product Certificates: For each type of unit.
- D. Sample Warranty: For manufacturer's special warranty.

#### 1.8 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of the Construction Contract Clauses, Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For each type of unit to include in maintenance manuals. Include manufacturer's written cleaning and stain-removal instructions.

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1.9 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
  - 1. Build mockup of typical ceiling area as shown on Drawings.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Ceilings shall maintain the quality as instituted by the architect and AWI.
- C. Wood shall be kiln dried to 10 percent. Cracking, checking and warpage of members will not be acceptable.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Comply with unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install units until a permanent level of lighting is provided on surfaces to receive the units.
- C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:

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- a. Acoustical performance.
  - b. Delamination of core from veneer product.
  - c. Warping of core.
2. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain ceiling units specified in this Section from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 50 or less.

### 2.3 SUSPENDED WOOD CEILING GRILLE (WD-1)

- A. Suspended Wood Ceiling Grille: Manufacturer's standard panel construction consisting of individual solid wood slats attached to a dowel to form an overall panel consisting of 4 slats with reveals in between.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong's WoodWorks Linear Veneered Panels, or comparable product by one of the following:
    - a. Certainteed.
    - b. Decoustics Limited; a Saint Gobain company.
    - c. USG Corportation.
  - 2. Mounting: T-hook and hung from ceiling with manufacturer's suspension system.
  - 3. Planks: To be selected from manufacturer's standard veneers.
  - 4. Slat Size: 5-3/4 inches by 3/4 inch.
  - 5. Edge Profile: Square.
  - 6. Reveals Between Planks: 1/4-inch
  - 7. Nominal Overall Panel Size: 24 inches by 96 inches consisting of 4 slats per panel.
  - 8. Acoustical Infill: BioAcoustic Infill - Black Matte.

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- B. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.
  - 1. Material: ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 coating designation with ASTM B209 aluminum cap
  - 1. Structural Classification: Heavy-duty system.
  - 2. Face Width: 15/16 inch
  - 3. Finish: Flat black on all product faces.
    - a. All perimeter clips or other exposed fasteners and hardware are to be field paint black.

## 2.4 METAL SUSPENSION SYSTEM

- A. Components:
  - 1. Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have a rotary stitching.
    - a. Structural Classification: ASTM C 635 heavy duty.
- B. Attachment Devices:
  - 1. Size for five times design load indicated in ASTM C 635, Table 1, direct hung unless otherwise indicated.
- C. Wire for Hangers and Ties:
  - 1. ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least three times design load, but not less than 12 gauge.
- D. Suspension Accessories: Integrated lighting.
  - 1. Provide manufacturer's standard framing and accessories as required for integration of lighting and mechanical systems.
  - 2. Provide edge trims as indicated on Drawings.

## 2.5 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated.
- B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

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1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.
5. Chords, radii, and diameters.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of suspended wood ceilings.
  1. Balance border widths at opposite edges of each ceiling.
  2. Avoid using less-than-half-width units.

#### 3.3 INSTALLATION

- A. Install suspension system and panels in compliance with ASTM C636; CISCA Seismic Guidelines; approved construction drawings; with the authorities having jurisdiction; and in accordance with the manufacturer's installation instructions.
- B. Install after building is enclosed and between 60-85 deg. F and not more than 70 percent relative humidity prior to start of installation.
- C. Variation from Alignment with Surfaces: Plus or minus 1/16 inch in 48 inches accumulative.
- D. Suspend ceiling hangers from building's structural members and as follows:
  1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns in 3 inches. Connect hangers directly either to structures or



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- to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
  - 5. Do not attach hangers to roof deck. Attach hangers to structural members.
  - 6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  - 7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- E. Install edge moldings and trim at perimeter of ceiling area and where necessary to conceal edges and ends of wood units.
- 1. Screw-attach metal moldings to substrate at intervals of not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
  - 2. Do not use exposed fasteners on moldings and trim.
- F. Grid Suspension Systems: Space main beams at 48 inches o.c.
- 1. Install cross tees to form modules sized in accordance with manufacturer's written installation instructions.
  - 2. Remove and replace dented, bent, or kinked members.
- G. Linear-Carrier Suspension Systems: Install carriers at no more than 24 inches o.c. aligned and securely interlocked with one another.
- 1. Install stabilizer channels, tees, and bars at regular intervals to stabilize carriers and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated.
  - 2. Remove and replace dented, bent, or kinked members.
- H. Install wood components and accessories in accordance with manufacturer's written instructions and to accommodate natural expansion and contraction of wood products resulting from fluctuations in humidity.
- I. Cut wood components for accurate fit at borders and at interruptions and penetrations by other work through ceilings.
- 1. Stiffen edges of cut wood components as required to eliminate variations in flatness.
- J. Treat field-cut edges of wood components in accordance with manufacturer's written recommendations; finish exposed field cuts to match factory finish.
- 1. Solid-Wood Planks: Use solid-wood end caps to conceal exposed field-cut edges.
- K. Install wood components in coordination with suspension system and moldings and trim.
- 1. Install wood components in patterns indicated on Drawings.

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3.4 INSTALLATION

- A. Install units in locations indicated.
- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.5 CLEANING

- A. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION

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SECTION 096340 – DIMENSION STONE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Dimension stone exterior flooring.
- 2. Dimension stone edging and steps.

B. Related Requirements:

- 1. Section 079200 "Joint Sealants" for sealing joints in stone flooring system with elastomeric sealants.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each variety of stone, stone accessory, and manufactured product.
- C. Shop Drawings: Include plans, sections, details, and attachments to other work.
  - 1. Show locations and details of joints both within stone flooring and between stone flooring and other finish materials.
  - 2. Show direction of veining, grain, or other directional patterns.
- D. Samples for Initial Selection: For joint materials involving color selection.
- E. Samples for Verification:
  - 1. For each stone type indicated, in sets of Samples not less than 12 inches square. Include at least three or more Samples in each set and show the full range of color and other visual characteristics in completed Work.
  - 2. For each color of pointing mortar required.

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1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Qualification Data: For fabricator.
- C. Material Test Reports:
  - 1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, according to referenced ASTM standards. Base reports on testing within previous three years.

1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Maintenance Data: For stone flooring to include in maintenance manuals. Include product data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone flooring and dimension stone.
- B. Installer Qualifications: A firm or individual experienced in installing stone flooring similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
  - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
  - 2. Store stone on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
- B. Mark stone units, on surface that is concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels, so that they are right side up when units are installed.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

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## 1.9 FIELD CONDITIONS

- A. Maintain air and material temperatures to comply with requirements of installation material manufacturers, but not less than 50 deg F during installation and for seven days after completion.
- B. Cold-Weather Requirements for Exterior Stone Flooring: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- C. Hot-Weather Requirements for Stone Flooring: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 and with the following:
  - 1. Maintain temperature of materials below 100 deg F.
  - 2. Do not apply mortar to substrates with temperatures of 100 deg F and above.
  - 3. When the ambient temperature exceeds 90 deg F, fog spray installed stone flooring until damp at least three times a day until flooring is three days old.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain stone, from single quarry with resources to provide materials of consistent quality in appearance and physical properties.
  - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
- B. Stone Fabricators: Subject to compliance with requirements, available fabricators whose products may be incorporated into the Work include, but are not limited to, the following:
  - 1. Swenson Granite Works, Concord, NH.
  - 2. Fletcher Granite, Westford, MA.
  - 3. Freshwater Stone, Orland, ME.

### 2.2 GRANITE

- A. Material Standard: Comply with ASTM C615/C615M.
- B. Description: Uniform, fine to medium-grained, gray stone without veining.
- C. Varieties and Sources: Subject to compliance with requirements, available stone varieties that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Woodbury Grey by Swenson Granite Works.
  - 2. Chelmsford Grey by Fletcher Granite.
  - 3. Freshwater Pearl by Freshwater Stone.

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- D. Finish: Thermal, unless indicated otherwise.
- E. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

## 2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type II.
  - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C150/C150M, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.
  - 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. Essroc.
    - b. Heidelberg Materials.
    - c. Holcim (US) Inc.
    - d. Lafarge North America Inc.
    - e. Mutual Materials Co.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in stone masonry mortar.
  - 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. Davis Colors.
    - b. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
    - c. Lanxess Corporation.
    - d. Solomon Colors Inc.
- E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.
  - 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. Heidelberg Materials.

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- b. [Holcim \(US\) Inc.](#)
  - c. [Lafarge North America Inc.](#)
  - d. [Mutual Materials Co.](#)
- F. Aggregate: ASTM C144; except for, use aggregate graded with 100 percent passing No. 16 sieve.
  - 1. Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.
- G. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part of or all gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.
  - 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. [Boiardi Products Corporation; a QEP company.](#)
    - b. [Bostik; Arkema.](#)
    - c. [C-Cure.](#)
    - d. [Custom Building Products.](#)
    - e. [DAP Products Inc.](#)
    - f. [H.B. Fuller Construction Products Inc. / TEC.](#)
    - g. [Laticrete International, Inc.](#)
    - h. [MAPEI Corporation.](#)
    - i. [Parex, a Sika brand.](#)
    - j. [Sakrete; CRH Americas, Oldcastle APG.](#)
    - k. [Southern Grouts & Mortars, Inc.](#)
    - l. [Summitville Tiles, Inc.](#)

## 2.4 ACCESSORIES

- A. Epoxy Grout: ASTM C881, Type IV.
- B. Temporary Spacers: Resilient plastic, nonstaining to stone, sized to suit joint thickness.
- C. Cleavage Membrane (Crack Isolation Membrane): Polyethylene sheeting, ASTM D4397, 4.0 mils thick.
- D. Reinforcing Wire: Galvanized, welded, 0.124-inch-diameter wire; 4-by-4-inch mesh; comply with ASTM A1064/A1064M, except for minimum wire size.
- E. Cork Joint Filler: Preformed strips complying with ASTM D1752, Type II.
- F. Joint Sealants: Manufacturer's standard sealants that comply with applicable requirements in Section 079200 "Joint Sealants" and will not stain the stone they are applied to.
  - 1. Use mildew-resistant joint sealant.
  - 2. Colors: Provide colors of exposed sealants to match other joints in stone adjoining sealed joints unless otherwise indicated.

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- G. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

## 2.5 MORTAR MIXES

- A. Mortar: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
  - 1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
  - 2. Combine mortar materials and thoroughly mix in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.
  - 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding any water. Add only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Dry-Pack Mortar Bed: Mix by volume one-part portland cement with three parts clean, washed sand conforming to ASTM C144. The dry-pack mortar must be hydrated to the extent that it may be compacted into a ball in one's hand, but not so wet that it can be extruded between the fingers when squeezing the ball of mortar.
- C. Portland Cement-Lime Setting Mortar: ASTM C270, Proportion Specification, Type S. Use amount of water to produce a stiff mixture with a moist surface when bed is ready to receive stone.
- D. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions and to produce a stiff mixture with a moist surface when bed is ready to receive stone.
- E. Mortar-Bed Bond Coat: Mix neat cement and water to a creamy consistency.
- F. Cement-Paste Bond Coat: Mix neat cement with water to a consistency similar to that of thick cream.
- G. Pointing Mortar: Comply with requirements indicated above for setting mortar, including type and the following:
  - 1. Pigmented Pointing Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1:10, by weight.
  - 2. Packaged Portland Cement-Lime Mix Mortar: Use portland cement-lime mix of selected color.
  - 3. Colored-Aggregate Pointing Mortar: Produce color required by combining colored aggregates with portland cement of selected color.



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## 2.6 FABRICATION OF STONE

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
- B. Fabricate stone to comply with requirements indicated and with the following references:
  - 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
- C. Stone Flooring: Cut stone to produce pieces of thickness, size, and shape indicated.
  - 1. Stone Thickness: 2 inches unless otherwise indicated.
  - 2. Pattern: Diamond-grid pattern as indicated, approximately 2-feet 6-inches by 2-feet 6-inches.
  - 3. Stone Edges: Square cut with top corner slightly eased to prevent snipping.
  - 4. Joint Width: 3/8 inch, unless indicated otherwise.
- D. Stone Edging and Steps: Fabricate stone in sizes and profiles indicated.
  - 1. Stone Thickness: As indicated.
  - 2. Pattern: As indicated.
  - 3. Stone Edges: At mortar joints, square cut with top corner slightly eased to prevent snipping.
  - 4. Stone Edges: At exposed corners (stair treads and corners of edging) rounded to 3/16-inch radius.
  - 5. Joint Width: 3/8-inch, unless indicated otherwise.
- E. Carefully inspect finished stone units at fabrication plant for compliance with appearance, material, and fabrication requirements. Replace defective units. Clean sawed backs of stones to remove rust stains and iron particles.
  - 1. Grade and select stone for overall uniform appearance when assembled in place.
  - 2. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved Samples.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to receive dimension stone and conditions under which dimension stone will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of dimension stone.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of stone flooring.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. Allow concrete to cure a minimum of 28 days before installation of dimension stone.
- B. Verify concrete foundations and slabs are in suitable position (location and elevation) and condition and substrates are clean prior to installation of dimension stone.
- C. Vacuum concrete substrates to remove dirt, dust, debris, and loose particles.
- D. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- E. Before setting stone, clean dirty or stained stone surfaces by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 INSTALLATION, GENERAL

- A. Field cutting of stone steps and edging is not permitted. Verify dimensions prior to installation.
- B. Do necessary field cutting of stone flooring as stone is set. Cut lines straight and true, and finish field-cut edges to match shop-cut edges.
  - 1. Use power saws with diamond blades to cut stone.
- C. Set stone to comply with requirements indicated.
- D. Scribe and field cut stone as necessary to fit at obstructions. Produce neat joints of size specified or indicated.
- E. Provide control and expansion joints of widths and at locations indicated. Keep control and expansion joints free of mortar, grout, and other rigid materials.

3.4 INSTALLATION TOLERANCES

- A. Variation in Line: For positions shown in plan for edges of flooring, edging, and steps, changes in color or finish, and continuous joint lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.
- B. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/16 inch or one-fourth of nominal joint width, whichever is less.
- C. Variation in Surface Plane: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum from level or slope indicated.
- D. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/32-inch difference between planes of adjacent units.

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3.5 ADDITIONAL INSTALLATION TOLERANCES FOR STEPS

- A. Granite steps must meet the dimensional uniformity requirements of NFPA 101, including:
  - 1. No variation in excess of 3/16-inch in the depth of adjacent treads or in the height of adjacent risers.
  - 2. The tolerance between the largest and smallest riser and between the largest and smallest tread must not exceed 3/8-inch.
  - 3. The uniformity requirements do not apply to the bottom riser adjoining the sidewalk. Refer to Sheet CG101 for finish sidewalk grades adjacent to the bottom riser.
  - 4. Riser height is measured as the vertical distance between tread nosings.

3.6 INSTALLATION OF STONE BONDED TO CONCRETE

- A. Verify position of anchor bolts and transfer locations to bottom of stone. Drill holes as indicated in stone bottom for anchoring stone.
- B. Saturate concrete with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
- C. Apply mortar-bed bond coat to damp concrete and broom to provide an even coating that completely covers the concrete. Do not exceed 1/16-inch thickness. Limit area of mortar-bed bond coat to avoid its drying out before placing setting bed.
- D. Apply mortar bed immediately after applying mortar-bed bond coat. Spread and tamp to uniform thickness at elevations required for setting stone to finished elevations indicated.
- E. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.
- F. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, partially fill drill holes with stiff epoxy grout and apply uniform 1/16-inch-thick bond coat to mortar bed or to back of each stone unit.
- G. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with mortar bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.
- H. Rake out joints to depth required to receive pointing mortar as units are set.
- I. Place crushed stone backfill beneath and behind steps in layers corresponding to step height. Compact crushed stone firmly in place, being careful to avoid displacement of stone steps.
- J. Point joints after setting. Unless indicated otherwise, fill joints full with mortar type and color indicated. Tool joints flat, uniform, and smooth, without visible voids.

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### 3.7 INSTALLATION OF STONE OVER DRY PACK MORTAR BED

- A. Provide crack isolation membrane over concrete slab-on-ground to prevent bonding of the dry-pack mortar to the concrete. Lap joints at least 4-inches.
- B. Spread approximately one-half thickness of dry-pack mortar (+/- 1-inch) over the crack isolation membrane and screed flat to the desired elevation.
- C. Place galvanized welded wire fabric, overlapped one full mesh at joints, within the middle third of the dry-pack mortar bed. Hold edges back from vertical surfaces and expansion joints about 1-inch.
- D. Spread the remaining dry-pack mortar (+/- 1-inch for a total thickness of +/- 2-inches) and screed flat to the desired elevation. Prior to setting stone flooring, loosen or "fluff-up" the mortar surface with a shallow toothed rake to assist in compression of the dry-pack when tamping the stone into position.
- E. Before positioning the stone flooring onto the dry-pack mortar bed, sponge clean, then dry the back of the stone. Parge the back of the stone with a thick layer of neat cement paste.
- F. Immediately before placing the stone flooring on the mortar bed, sprinkle the dry-pack with water using a watering can with multiple small (less than or equal to 1/16") perforations.
- G. Place the stone flooring on the dry-pack mortar bed and tamp with a non-marring mallet until firmly bedded to the proper elevation. Several iterations of removal and replacement of the stone may be required to facilitate adding or removing bedding material before the proper elevation and grade is achieved.
- H. Prevent traffic from traversing the stone surface for a minimum of 72-hours. After a minimum of 24-hours, fill joints with approved pointing mortar. Mortar must not be overhydrated and the stiff mixture is to be compacted into the joints until level with the stone surface, then tooled to a slight concave profile.

### 3.8 INSTALLATION OF JOINT-SEALANT

- A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

### 3.9 ADJUSTING AND CLEANING

- A. Remove and replace stonework of the following description:
  1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
  2. Defective joints.
  3. Dimension stone not matching approved Samples.
  4. Stonework not complying with other requirements indicated.
- B. Replace in a manner that results in stonework matching approved Samples, complying with other requirements, and showing no evidence of replacement.

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- C. In-Progress Cleaning: Clean stonework as work progresses. Remove mortar fins and smears before tooling joints.
- D. Clean stonework after setting and pointing are complete. Use procedures recommended by stone fabricator for application types.

3.10 PROTECTION

- A. Prohibit traffic from installed stone for a minimum of 72 hours.
- B. Protect installed stonework during construction with nonstaining kraft paper. Where adjoining areas require construction work access, cover stonework with a minimum of 3/4-inch untreated plywood over nonstaining kraft paper.

END OF SECTION

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SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Vinyl base.
  - 2. Rubber molding accessories.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

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1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong World Industries, Inc
  - 2. Flexco Corporation
  - 3. Johnsonite; a Tarkett company
  - 4. Roppe Corporation; Roppe Holding Company
  - 5. VPI Corporation
- B. Product Standard: ASTM F1861, Type TV (vinyl, thermoplastic).
  - 1. Group: I (solid, homogeneous).
  - 2. Style and Location:
    - a. Style A, Cove: Provide in areas with resilient floor coverings.
- C. Minimum Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors and Patterns: As selected by Architect from manufacturer's full range.

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## 2.2 RUBBER MOLDING ACCESSORY (TS)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Roppe Corporation; Roppe Holding Company.
  - 2. VPI Corporation.
- B. Description: Rubber reducer strip for resilient floor covering and transition strips.
- C. Profile and Dimensions: As indicated.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: As selected by Architect from manufacturer's full range.

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.



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1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
  1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Form without producing discoloration (whitening) at bends.
  2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Miter or cope corners to minimize open joints.

### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
  1. Remove adhesive and other blemishes from surfaces.
  2. Sweep and vacuum horizontal surfaces thoroughly.
  3. Damp-mop horizontal surfaces to remove marks and soil.

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- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION

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SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Solid vinyl floor tile.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Shop Drawings: For each type of resilient floor tile.
  - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 2. Show details of special patterns.
- D. Samples: Full-size units of each color, texture, and pattern of floor tile required.
- E. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For each type of floor tile to include in maintenance manuals.

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1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish one box for every 30 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 SOLID VINYL FLOOR TILE (LVT-1)

- A. Products: Subject to compliance with requirements, provide Basis of Design product to be Spacia Abstract by Mannington Commercial.

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- B. Tile Standard: ASTM F1700.
  - 1. Class: Class III, Printed Film Vinyl Tile.
  - 2. Type: B, Embossed Surface.
- C. Thickness: 0.098 inch.
- D. Size: 12 by 18 inches.
- E. Colors and Patterns: As selected by Architect from manufacturer's full range.

## 2.2 SOLID VINYL FLOOR TILE (LVT-2)

- A. Products: Subject to compliance with requirements, provide Basis of Design product of Amtico Wood by Mannington Commercial.
- B. Tile Standard: ASTM F1700.
  - 1. Class: Class III, Printed Film Vinyl Tile.
  - 2. Type: B, Embossed Surface.
- C. Thickness: 0.098 inch.
- D. Size: 6 by 36 inches.
- E. Colors and Patterns: As selected by Architect from manufacturer's full range.

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
  - 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 95 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

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- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- E. Cover floor tile until Substantial Completion.

END OF SECTION

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SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Carpet tile.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

C. Shop Drawings: For carpet tile installation, showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of carpet tile.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.



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1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Qualification Statements: For Installer.
- D. Sample Warranties: For carpet tile.

1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For carpet tiles. Include the following:
  - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 full-size units.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.7 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by carpet tile manufacturer.

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1.8 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  2. Failures include, but are not limited to, the following:
    - a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
    - b. Loss of tuft-bind strength.
    - c. Excess static discharge.
    - d. Delamination.
    - e. Dimensional instability.
  3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPTT-1)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bentley Mills, Inc.
  2. Engineered Floors.
  3. Interface, Inc.
  4. J&J Flooring Group LLC.
  5. Mannington Commercial; a business unit of Mannington Mills, Inc.
  6. Mohawk Carpet, LLC; The Mohawk Group.
  7. Shaw Industries Group, Inc.; Berkshire Hathaway Company.
  8. StaticSmart; Julie Industries.
  9. Tarkett USA.
  10. van Gelder, Inc.
- B. Color: As selected by Architect from manufacturer's full range.
- C. Pattern: As selected by Architect from manufacturer's full range.
- D. Fiber Content: 100 percent recycled content nylon.
- E. Fiber Type: AquaFil.
- F. Pile Characteristic: Tufted textured loop pile.
- G. Density: 8,550 oz./cu. yd.
- H. Stitches: 9.00 stitches per inch.
- I. Gauge: 1/12 ends per inch.

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- J. Primary Backing/Backcoating: Manufacturer's standard backing.
- K. Secondary Backing: Manufacturer's standard material.
- L. Backing System: GlasBac.
- M. Size: 20 by 20 inches.
- N. Applied Treatments:
  - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.
  - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
    - a. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.
- O. Performance Characteristics:
  - 1. Texture Appearance Retention Rating (TARR): Severe traffic, 3.5 minimum in accordance with ASTM D7330.
  - 2. Dry Breaking Strength: Not less than 100 lbf in accordance with ASTM D2646.
  - 3. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
  - 4. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.
  - 5. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) in accordance with AATCC 16.3 Option 3.

## 2.2 CARPET TILE (CPTT-2)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bentley Mills, Inc.
  - 2. Engineered Floors.
  - 3. Interface, Inc.
  - 4. J&J Flooring Group LLC.
  - 5. Mannington Commercial; a business unit of Mannington Mills, Inc.
  - 6. Mohawk Carpet, LLC; The Mohawk Group.
  - 7. Shaw Industries Group, Inc.; Berkshire Hathaway Company.
  - 8. StaticSmart; Julie Industries.
  - 9. Tarkett USA.
  - 10. van Gelder, Inc.
- B. Color: As selected by Architect from manufacturer's full range.
- C. Fiber Content: 100 percent nylon 6,6.
- D. Fiber Type: Type 6,6 Nylon.
- E. Pile Characteristic: Tufted textured loop pile.

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- F. Density: 9,771 oz./cu. yd.
- G. Pile Thickness: 0.07 inches for finished carpet tile.
- H. Stitches: 8.30 stitches per inch.
- I. Gauge: 1/12 ends per inch.
- J. Primary Backing/Backcoating: Manufacturer's standard backing.
- K. Secondary Backing: Manufacturer's standard material.
- L. Backing System: GlasBac.
- M. Size: 20 by 20 inches.
- N. Applied Treatments:
  - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.
  - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
    - a. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.
- O. Performance Characteristics:
  - 1. Texture Appearance Retention Rating (TARR): Heavy traffic, 3.0 minimum in accordance with ASTM D7330.
  - 2. Dry Breaking Strength: Not less than 100 lbf in accordance with ASTM D2646.
  - 3. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
  - 4. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.
  - 5. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) in accordance with AATCC 16.3 Option 3.

### 2.3 CARPET TILE (CPTT-3)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bentley Mills, Inc.
  - 2. Engineered Floors.
  - 3. Interface, Inc.
  - 4. J&J Flooring Group LLC.
  - 5. Mannington Commercial; a business unit of Mannington Mills, Inc.
  - 6. Mohawk Carpet, LLC; The Mohawk Group.
  - 7. Shaw Industries Group, Inc.; Berkshire Hathaway Company.
  - 8. StaticSmart; Julie Industries.
  - 9. Tarkett USA.
  - 10. van Gelder, Inc.

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- B. Color: As selected by Architect from manufacturer's full range.
- C. Pattern: As selected by Architect from manufacturer's full range.
- D. Fiber Content: 100 percent nylon 6,6.
- E. Pile Characteristic: Patterned loop pile.
- F. Density: 5,142/cu. yd..
- G. Pile Thickness: 0.98 for finished carpet tile.
- H. Stitches: 10.0 per inch.
- I. Gauge: 1/12.
- J. Surface Pile Weight: 15 oz./sq. yd.
- K. Primary Backing/Backcoating: Manufacturer's standard composite materials.
- L. Secondary Backing: Manufacturer's standard material.
- M. Backing System: Infinity 2 Modular.
- N. Size: 12 by 36 inches.
- O. Applied Treatments:
  - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.
  - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
    - a. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.
- P. Performance Characteristics:
  - 1. Texture Appearance Retention Rating (TARR): Moderate traffic, 2.5 minimum in accordance with ASTM D7330.
  - 2. Dry Breaking Strength: Not less than 100 lbf in accordance with ASTM D2646.
  - 3. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
  - 4. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.
  - 5. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) in accordance with AATCC 16.3 Option 3.

## 2.4 CARPET TILE (CPTT-4)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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1. Bentley Mills, Inc.
  2. Engineered Floors.
  3. Interface, Inc.
  4. J&J Flooring Group LLC.
  5. Mannington Commercial; a business unit of Mannington Mills, Inc.
  6. Mohawk Carpet, LLC; The Mohawk Group.
  7. Shaw Industries Group, Inc.; Berkshire Hathaway Company.
  8. StaticSmart; Julie Industries.
  9. Tarkett USA.
  10. van Gelder, Inc.
- B. Color: As selected by Architect from manufacturer's full range.
- C. Pattern: As selected by Architect from manufacturer's standard.
- D. Fiber Content: 50 percent nylon 6,6, 50 percent nylon 6.
- E. Pile Characteristic: Textured patterned loop pile.
- F. Density: 7,005 oz./cu. yd..
- G. Pile Thickness: 0.185 for finished carpet tile.
- H. Stitches: 10.0 per inch.
- I. Gauge: 1/12 per inch.
- J. Total Weight: 36 oz./sq. yd. for finished carpet tile.
- K. Primary Backing/Backcoating: Manufacturer's standard composite materials.
- L. Secondary Backing: Manufacturer's standard material.
- M. Backing System: Infinity 2 modular.
- N. Size: 18 by 36 inches.
- O. Applied Treatments:
1. Soil-Resistance Treatment: Manufacturer's standard treatment.
  2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
    - a. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.
- P. Performance Characteristics:
1. Texture Appearance Retention Rating (TARR): Severe traffic, 3.5 minimum in accordance with ASTM D7330.
  2. Dry Breaking Strength: Not less than 100 lbf in accordance with ASTM D2646.

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3. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
4. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.

## 2.5 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended in writing by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive types to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and that are recommended in writing by carpet tile manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
  1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 95 percent relative humidity level measurement.
    - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

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### 3.2 PREPARATION

- A. General: Comply with CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, in accordance with manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

### 3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended in writing by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive and other surface blemishes using cleaner recommended in writing by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 13.7.



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- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

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SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Surface preparation of interior substrates and application of the following:
  - 1. Primers.
  - 2. Water-based finish coatings.
- B. Related Requirements:
  - 1. Section 099113 "Exterior Painting."

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
  - 1. Include preparation requirements and application instructions.
  - 2. Indicate VOC content.
- C. Samples: For each type of topcoat product.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in applicable interior painting schedule articles to cross-reference paint systems specified in this Section. Include color designations.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

1.4 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

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PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each paint product from single source from single manufacturer.

2.2 INTERIOR PAINTS, GENERAL

- A. Interior Paints: Subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to products listed in product types below and applicable interior painting schedule articles for the paint category indicated.
- B. Material Compatibility:
  - 1. Materials for use within each paint system must be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.
- C. VOC Content: For field applications that are inside the weatherproofing system, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
  - 1. Flat Paints and Coatings: 50 g/L.
  - 2. Nonflat Paints and Coatings: 50 g/L.
  - 3. Primers, Sealers, and Undercoaters: 100 g/L.
- D. Colors: As selected by Architect from manufacturer's full range.
  - 1. 20 percent of surface area will be painted with deep tones.

2.3 PRIMERS

- A. Interior, Institutional Low-Odor/VOC Primer Sealer: Water-based primer sealer with low-odor characteristics and a VOC of less than 10 grams per liter for use on new interior plaster, concrete, and gypsum wallboard surfaces that are subsequently to be painted with latex finish coats.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Behr Paint Company (Behr Process LLC)
    - b. Benjamin Moore & Co.
    - c. PPG Paints; PPG Industries, Inc.
    - d. Sherwin-Williams Company (The)
- B. Water-Based, Rust-Inhibitive Primer: Corrosion-resistant, water-based-emulsion primer; formulated for resistance to flash rusting when applied to cleaned, ferrous metal substrates subject to mildly corrosive environments.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Behr Paint Company (Behr Process LLC)
  - b. Benjamin Moore & Co.
  - c. PPG Paints; PPG Industries, Inc.
  - d. Sherwin-Williams Company (The)
- C. Water-Based, Galvanized-Metal Primer: Corrosion-resistant, pigmented, acrylic primer; formulated for use on cleaned/etched galvanized metal substrates to prepare it for subsequent water-based coatings.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Behr Paint Company (Behr Process LLC)
    - b. Benjamin Moore & Co.
    - c. PPG Paints; PPG Industries, Inc.
    - d. Sherwin-Williams Company (The)

## 2.4 WATER-BASED FINISH COATINGS

- A. Interior Latex Paint: Pigmented, water-based coating for use on interior primed/sealed plaster and gypsum board, and on primed wood and metals.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Behr Paint Company (Behr Process LLC)
    - b. Benjamin Moore & Co.
    - c. PPG Paints; PPG Industries, Inc.
    - d. Sherwin-Williams Company (The)
- B. Interior, High-Performance Architectural Latex: Water-based, pigmented, low-VOC, emulsion coating formulated to provide a significantly higher level of performance than conventional latex paints in the areas of scrub resistance, burnish resistance, and ease of stain removal.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Behr Paint Company (Behr Process LLC)
    - b. Benjamin Moore & Co.
    - c. PPG Paints; PPG Industries, Inc.
    - d. Sherwin-Williams Company (The)
- C. Interior, Water-Based Alkyd Paint: Water-based, pigmented, low-VOC alkyd paint formulated for flash rust and water resistance and for use on interior, primed, plaster, and metal surfaces.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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- a. Behr Paint Company (Behr Process LLC)
- b. Benjamin Moore & Co.
- c. PPG Paints; PPG Industries, Inc.
- d. Sherwin-Williams Company (The)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Gypsum Board: 12 percent. Verify that finishing compound is dry and sanded smooth.
  - 2. Plaster: 12 percent. Verify that plaster is fully cured.
- C. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove loose rust, loose mill scale, loose shop primer, and other loose foreign matter. Clean using methods recommended in writing by paint manufacturer but not less than the following:
  - 1. SSPC-SP 3.

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- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

### 3.3 APPLICATION OF INTERIOR PAINT PRODUCTS

- A. Apply paints in accordance with manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Paint entire exposed surface of window frames and sashes.
  - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 6. Primers specified in the applicable interior painting schedule articles may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  - 1. Paint the following work where exposed to view in occupied spaces:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - h. Other items as directed by Architect.
  - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

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### 3.4 FIELD QUALITY CONTROL

- A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.
  - 1. Touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.
  - 3. Cost of retesting is Contractor's responsibility.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
  - 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
  - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
  - 3. Allow empty paint cans to dry before disposal.
  - 4. Collect waste paint by type and deliver to recycling or collection facility.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 INTERIOR PAINTING SCHEDULE, METAL SUBSTRATES

- A. Steel and Iron Substrates:
  - 1. Latex System, Alkyd Primer :
    - a. Prime Coat: Alkyd metal primer or shop primer specified in Section where substrate is specified.
    - b. Intermediate Coat: Matching topcoat.
    - c. Topcoat: Interior latex paint, semigloss.
  - 2. Institutional Low-Odor/VOC Latex System :
    - a. Prime Coat: Water-based rust-inhibitive primer.
    - b. Intermediate Coat: Matching topcoat.
    - c. Topcoat: Interior, latex, institutional low odor/VOC, semigloss.

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3. High-Performance Architectural Latex System :
  - a. Prime Coat: Alkyd metal primer or shop primer specified in Section where substrate is specified.
  - b. Intermediate Coat: Matching topcoat.
  - c. Topcoat: Topcoat: Interior, high-performance architectural latex, semigloss.

B. Galvanized Metal Substrates:

1. Latex System :
  - a. Prime Coat: Water-based galvanized primer.
  - b. Intermediate Coat: Matching topcoat.
  - c. Topcoat: Interior latex paint, semigloss.
2. High-Performance Architectural Latex System :
  - a. Prime Coat: Water-based galvanized primer.
  - b. Intermediate Coat: Matching topcoat.
  - c. Topcoat: Interior, high-performance architectural latex, semigloss.

3.7 INTERIOR PAINTING SCHEDULE, GYPSUM-BASED SUBSTRATES

A. Gypsum Board and Plaster Substrates:

1. Latex over Latex Sealer System :
  - a. Prime Coat: Interior latex primer sealer.
  - b. Intermediate Coat: Matching topcoat.
  - c. Topcoat: Interior latex paint, eggshell.
2. Latex over Alkyd Primer System (for Plaster Only) :
  - a. Prime Coat: Interior alkyd primer sealer.
  - b. Intermediate Coat: Matching topcoat.
  - c. Topcoat: Interior latex paint, semigloss.
3. High-Performance Architectural Latex System :
  - a. Prime Coat: Interior latex primer sealer.
  - b. Intermediate Coat: Matching topcoat.
  - c. Topcoat: Interior, high-performance architectural latex, eggshell.

END OF SECTION



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SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal primers.
2. Epoxy coatings.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming structural steel substrates with primers specified in this Section.
2. Section 099123 "Interior Painting" for general field painting.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

C. Samples: For each type of topcoat product.

D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in High-Performance Coating Schedules. Include color designations and production runs (batch numbers).

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.4 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.

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- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain each coating system product from single source from single manufacturer.

### 2.2 HIGH-PERFORMANCE COATING PRODUCTS, GENERAL

- A. High-Performance Coating Products: Subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to products listed in product types below and applicable exterior high-performance coating schedule articles for the coating category indicated.
- B. Material Compatibility:
  - 1. Materials for use within each coating system must be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
  - 2. For each coat in a coating system, provide products recommended in writing by topcoat manufacturer for use in system and on substrate indicated.
- C. VOC Content: For field applications, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
  - 1. Nonflat Paints and Coatings: 50 g/L.
  - 2. Primers, Sealers, and Undercoaters: 100 g/L.
  - 3. Zinc-Rich Industrial Maintenance Primers: 100 g/L.

### 2.3 METAL PRIMERS

- A. Epoxy, Anticorrosive Primer: Solvent-based, two-component, epoxy, anti-corrosive primer; formulated for use on ferrous and galvanized metal substrates.
  - 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. PPG Paints; PPG Industries, Inc.
    - b. Sherwin-Williams Company (The)
    - c. Tnemec Company, Inc.

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## 2.4 EPOXY COATINGS

- A. High-Build Epoxy: Two-component epoxy, high-solids, self-priming coating for use on interior or exterior substrates.
  - 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. PPG Paints; PPG Industries, Inc.
    - b. Sherwin-Williams Company (The)
    - c. Tnemec Company, Inc.
  - 2. Gloss Level: Manufacturer's standard low gloss.

## 2.5 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
  - 1. Owner will engage services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
  - 2. Testing agency will perform tests for compliance with product requirements.
  - 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor to remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, both coatings are incompatible.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.

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- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Steel Substrates: Remove loose rust, loose mill scale, loose shop primer, and other foreign matter. Clean using methods recommended in writing by coating manufacturer but not less than the following:
  - 1. SSPC-SP 11.
- E. Galvanized Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

### 3.3 APPLICATION OF HIGH-PERFORMANCE COATINGS

- A. Apply coating system products in accordance with manufacturer's written instructions.
  - 1. Use applicators and techniques suited for coating and substrate indicated.
  - 2. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
  - 1. Touch up and restore coated surfaces damaged by testing.

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2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written instructions, apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written instructions.
3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING AND PROTECTION

- A. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- B. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE, METAL SUBSTRATES

- A. Galvanized Metal Substrates:
  1. Epoxy System:
    - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
    - b. Intermediate Coat: Epoxy, matching topcoat.
    - c. Topcoat: Epoxy, low gloss.

END OF SECTION

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SECTION 101200 - DISPLAY CASES

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. Display cases.

1.3 DEFINITIONS

- A. Bulletin Board: Glazed cabinet with tackboard panel, without shelves, typically of shallow depth for display of paper documents.
- B. Display Case: Glazed cabinet with tackboard panel back surface and adjustable shelves.
- C. Tackboard Panel: A material for holding push-pins or tacks typically consisting of a facing; such as fabric, vinyl, or cork; adhered to a substrate; such as fiberboard, hardboard, particleboard.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases. Include furnished specialties and accessories.
  - 2. Include electrical characteristics for illuminated display cases.
- C. Shop Drawings: For display cases.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Show location of seams and joints in tackboard panels.
  - 3. Include sections of typical trim members.
  - 4. Include diagrams for wiring of illuminated display cases.
- D. Samples for Initial Selection: For each type of exposed finish.

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1. Include Samples of fabric panels and factory-finished trim involving color finish selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Test Reports: For fabric panels, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For display cases to include in maintenance manuals.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install display cases for indoor installations until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain display cases from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 450 or less.
- B. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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2.3 DISPLAY CASE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide “390 Recessed Display Case,” Claridge Products and Equipment, or comparable product by one of the following:
1. A-1 Visual Systems.
  2. ADP Lemco.
  3. AJW Architectural Products.
  4. Architectural School Products Ltd.
  5. Best-Rite; MooreCo, Inc.
  6. Ghent Manufacturing, Inc.
  7. Nelson-Harkins Industries.
  8. Newline Products, Inc.
  9. Platinum Visual Systems.
  10. Poblocki Sign Company.
  11. Tablet & Ticket Co. (The).
  12. Waddell Furniture; a division of Ghent Manufacturing, Inc.
- B. Recessed Display Case: Factory-fabricated display case; with finished interior, operable glazed doors at front, and trim on face to cover edge of recessed opening.
1. Display Case Cabinet: Extruded aluminum.
  2. Face Frame: Aluminum.
  3. Aluminum Finish: Manufacturer’s standard baked enamel or powder coat.
- C. Glazed Sliding Doors: Tempered glass; framed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
1. Thickness: Not less than 1/4-inch thick.
  2. Number of Doors: As indicated on Drawings.
- D. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
1. Shelf Depth: 12 inches.
  2. Number of Shelves: Three.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards extending full height of display case.
- F. Back Panel: Colored-fabric tackboard panel.
1. Color: As selected by Architect from manufacturer's full range.
- G. Illumination System: Manufacturer's recessed top-lighting system consisting of LED-strip fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
- H. Size: As indicated on Drawings.



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## 2.4 MATERIALS

- A. Hardboard: ANSI A135.4, tempered.
- B. Fiberboard: ASTM C 208.
- C. Particleboard: ANSI A208.1, Grade M-1.
- D. Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.
- E. Extruded-Aluminum Bars and Shapes: ASTM B 221, Alloy 6063.
- F. Aluminum Tubing: ASTM B 429/B 429M, Alloy 6063.
- G. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- H. High-Pressure Plastic Laminate: NEMA LD 3.
- I. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.
- J. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz/sq. yd.; with flame-spread index of 25 or less when tested in accordance with ASTM E84.

## 2.5 FABRICATION

- A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of illuminated units.
- C. Examine walls and partitions for proper backing for display cases.
- D. Examine walls and partitions for suitable framing depth if recessed units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
  - 1. Mounting Height: As indicated on Drawings.
- B. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches o.c.
- C. Comply with requirements specified elsewhere for connecting illuminated display cases.
- D. Install display case shelving level and straight.

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3.4 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION

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SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panel signs.
2. Dimensional characters.

1.2 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.3 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: For panel signs and dimensional characters.
1. Include fabrication and installation details and attachments to other work.
  2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
  3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
1. Panel Signs: Full-size Sample.
  2. Full-size Samples, if approved, will be returned to Contractor for use in Project.
- E. Product Schedule: For panel signs. Use same designations indicated on Drawings or specified.

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1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For manufacturer.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For signs to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of finishes beyond normal weathering.
    - b. Deterioration of embedded graphic image.
    - c. Separation or delamination of sheet materials and components.
  - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

2.2 PANEL SIGNS

- A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. APCO Graphics, Inc.
  - b. ASE, Inc.
  - c. ASI Sign Systems, Inc.
  - d. Advance Corporation.
  - e. Best Sign Systems, Inc.
  - f. Bunting Graphics, Inc.
  - g. Clarke Systems.
  - h. Diskey Sign Company.
  - i. Mohawk Sign Systems.
  - j. Nelson-Harkins Industries.
  - k. Signs & Decal Corp.
  - l. Vista System, LLC.
  - m. Vomar Products, Inc.
  - n. inpro Corporation.
2. Solid-Sheet Sign: Acrylic sheet, returns, and back with finish specified in "Surface Finish and Applied Graphics" Subparagraph and as follows:
  - a. Thickness: Manufacturer's standard for size of sign.
  - b. Surface-Applied, Flat Graphics: Applied baked enamel or powder coat.
  - c. Surface-Applied, Raised Graphics: Applied polymer characters and Braille.
  - d. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
3. Sign-Panel Perimeter: Finish edges smooth.
  - a. Edge Condition:
    - 1) Vertical Edges: Square cut.
    - 2) Horizontal Edges: Square cut.
  - b. Corner Condition in Elevation: Radius to match existing.
4. Mounting: Manufacturer's standard method for substrates indicated with two-face tape.
5. Surface Finish and Applied Graphics:
  - a. Integral Sheet Color: Acrylic sheet with color as selected by Architect from full range of industry colors.
6. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range and variable content as scheduled. Finish raised characters to contrast with background color, and finish Braille to match background color.
7. Flatness Tolerance: Sign is to remain flat or uniformly curved under installed conditions as indicated on Drawings and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

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## 2.3 PANEL-SIGN MATERIALS

- A. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

## 2.4 PANEL SIGN ACCESSORIES

- A. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

## 2.5 PANEL SIGN FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
  - 1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
  - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
  - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
  - 5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
  - 6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image is to be free of rough edges.

## 2.6 DIMENSIONAL CHARACTERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. A. R. K. Ramos.
  - 2. ASI-Modulex, Inc.
  - 3. Charleston Industries, Inc.
  - 4. Gemini Incorporated.
  - 5. Metal Arts; Div. of L&H Mfg. Co.
  - 6. Mohawk Sign Systems.
  - 7. Nelson-Harkins Industries.

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8. Signature Signs, Incorporated.
  9. Southwell Company (The).
- B. Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.
1. Character Material: Aluminum.
  2. Thickness: Manufacturer's standard.
  3. Color(s): Clear, satin polished finish.
  4. Mounting: Concealed studs, noncorroding for substrates encountered.
- C. Dimensional Character Sign Schedule:
1. Sign Type: Coordinate with Drawings.
    - a. Sign Size: As indicated.
    - b. Character Size: As indicated.
    - c. Text/Message: As indicated.
    - d. Location: As indicated.
- D. Materials:
1. Aluminum Castings: ASTM B26, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
  2. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- E. Accessories:
1. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
    - a. Use concealed fasteners and anchors unless indicated to be exposed.
    - b. For exterior exposure, furnish stainless steel devices unless otherwise indicated.
    - c. Exposed Metal-Fastener Components, General:
      - 1) Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
  2. Sign Mounting Fasteners:
    - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
    - b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
    - c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.



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2.7 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
  - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.
- C. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
- D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign and two-face tape.

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- E. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
  - 1. Flush Mounting: Mount characters with backs in contact with wall surface.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

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SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Childcare accessories.
3. Underlavatory guards.
4. Custodial accessories.

1.2 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
  1. Public-use washroom accessories.
  2. Childcare accessories.
  3. Underlavatory guards.
  4. Custodial accessories.
- C. Product Data Submittals: For each product.
  1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  1. Identify locations using room designations indicated.
  2. Identify accessories using designations indicated.

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1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, visible silver spoilage defects.
  - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design accessories and fasteners to comply with the following requirements:
  - 1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain each type of public-use washroom accessory from single source from single manufacturer.
- B. Toilet Tissue (Roll) Dispenser:
  - 1. Manufacturers: Subject to compliance with requirements, provide Double Roll Dispenser #2519 by Impact or comparable product by one of the following manufacturers:
    - a. Aluids; Krome USA Inc.]
    - b. ASI-American Specialties, Inc.
    - c. Bobrick Washroom Equipment, Inc
    - d. Bradley Corporation

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- e. Brey-Krause Manufacturing Co.
    - f. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
    - g. Seachrome Corporation
    - h. Tubular Specialties Manufacturing, Inc.
  - 2. Description: Double-roll dispenser.
  - 3. Mounting: Surface mounted.
  - 4. Operation: Noncontrol delivery with standard spindle.
  - 5. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
  - 6. Material and Finish: ABS Plastic, smoke color with see thru plastic front.
- C. Paper Towel (Folded) Dispenser:
- 1. Manufacturers: Subject to compliance with requirements, provide Ultra Fold Dispenser #T1700BK by San Jamar or comparable product by one of the following manufacturers:
    - a. Aluids; Krome USA Inc.
    - b. ASI-American Specialties, Inc.
    - c. Bobrick Washroom Equipment, Inc
    - d. Bradley Corporation
    - e. Brey-Krause Manufacturing Co.
    - f. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
    - g. Seachrome Corporation
    - h. Tubular Specialties Manufacturing, Inc.
  - 2. Mounting: Surface mounted.
  - 3. Material and Finish: ABS plastic, black.
  - 4. Lockset: Tumbler type.
  - 5. Refill Indicator: Pierced slots at sides or front.
- D. Soap Dispenser:
- 1. Manufacturers: Subject to compliance with requirements, provide Lite'n Foamy Dispenser #975700 by Spartan or a comparable product by one of the following:
    - a. Aluids; Krome USA Inc.
    - b. ASI-American Specialties, Inc.
    - c. Bobrick Washroom Equipment, Inc
    - d. Bradley Corporation
    - e. Brey-Krause Manufacturing Co.
    - f. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
    - g. Seachrome Corporation
    - h. Tubular Specialties Manufacturing, Inc.
  - 2. Description: Designed for manual operation and dispensing soap in lather form.
  - 3. Mounting: Vertically oriented surface mounted.
  - 4. Capacity: 30 ounces.
  - 5. Materials: ABS plastic, black.
  - 6. Lockset: Tumbler type.
  - 7. Refill Indicator: Window type.

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E. Grab Bar:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Aluids; Krome USA Inc.
  - b. ASI-American Specialties, Inc.
  - c. Bobrick Washroom Equipment, Inc
  - d. Bradley Corporation
  - e. Brey-Krause Manufacturing Co.
  - f. Construction Solutions
  - g. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
  - h. Oatey Co.
  - i. ProFlo; a Ferguson Enterprises, Inc. brand
  - j. Seachrome Corporation
  - k. Tubular Specialties Manufacturing, Inc.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
  - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. OD: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin and Tampon Vendor:

1. Manufacturers: Subject to compliance with requirements, provide Dual Napkin and Tampon Dispenser #H0SPECO D1-25C by Hospeco or comparable product by one of the following manufacturers:
  - a. ASI-American Specialties, Inc.
  - b. Bobrick Washroom Equipment, Inc
  - c. Bradley Corporation
  - d. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
  - e. Tubular Specialties Manufacturing, Inc.
2. Mounting: Surface mounted.
3. Capacity: 22 tampons and 15 size #4 box sanitary napkins.
4. Operation: Two coins (50 cents).
5. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
6. Lockset: Tumbler type with separate lock and key for coin box.

G. Sanitary-Napkin Disposal Unit:

1. Manufacturers: Subject to compliance with requirements, provide Sanitary Bin #FG614000WHT by Rubbermaid or comparable product by one of the following manufacturers:

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- a. ASI-American Specialties, Inc.
  - b. Bobrick Washroom Equipment, Inc
  - c. Bradley Corporation
  - d. Brey-Krause Manufacturing Co.
  - e. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
  - f. Seachrome Corporation
  - g. Tubular Specialties Manufacturing, Inc.
2. Mounting: Surface mounted.
  3. Door or Cover: Self-closing, disposal-opening cover.
  4. Receptacle: Removable.
  5. Material and Finish: ABS plastic, white.

H. Seat-Cover Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide personal seat cover dispenser #09506 by Kimberly Clark or comparable product by one of the following:
  - a. ASI-American Specialties, Inc.
  - b. Bobrick Washroom Equipment, Inc
  - c. Bradley Corporation
  - d. Brey-Krause Manufacturing Co.
  - e. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
  - f. Seachrome Corporation
  - g. Tubular Specialties Manufacturing, Inc.
2. Mounting: Surface mounted.
3. Minimum Capacity: 125 seat covers.
4. Exposed Material and Finish: ABS plastic, black.
5. Lockset: Tumbler type.

I. Mirror Unit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ASI-American Specialties, Inc.
  - b. Bobrick Washroom Equipment, Inc
  - c. Bradley Corporation
  - d. Brey-Krause Manufacturing Co.
  - e. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
  - f. Seachrome Corporation
  - g. Seawin Hospitality; Seawin Global
  - h. Tubular Specialties Manufacturing, Inc.
  - i.
2. Frame: Stainless steel channel.
  - a. Corners: Manufacturer's standard.

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3. Size: As indicated on Drawings.
4. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

J. Hook:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ASI-American Specialties, Inc.
  - b. Bobrick Washroom Equipment, Inc
  - c. Bradley Corporation
  - d. Brey-Krause Manufacturing Co.
  - e. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
  - f. Seachrome Corporation
  - g. Tubular Specialties Manufacturing, Inc.
2. Description: Double-prong unit.
3. Mounting: Concealed.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

## 2.3 CHILDCARE ACCESSORIES

- A. Source Limitations: Obtain each type of childcare accessory from single source from single manufacturer.

B. Diaper-Changing Station :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ASI-American Specialties, Inc.
  - b. Bradley Corporation
  - c. Diaper Deck & Co.
  - d. Foundations Worldwide, Inc.
  - e. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
  - f. Koala Kare Products; Bobrick Washroom Equipment, Inc.
  - g. Safe-Strap Company, LLC
  - h. Tubular Specialties Manufacturing, Inc.
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
  - a. Engineered to support minimum of 250 lb static load when opened.
3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: HDPE in manufacturer's standard color.



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## 2.4 UNDERLAVATORY GUARDS

### A. Underlavatory Guard :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Buckaroos, Inc.
  - b. Plumberex Specialty Products, Inc.
  - c. Truebro; IPS Corporation
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

## 2.5 CUSTODIAL ACCESSORIES

### A. Source Limitations: Obtain each type of custodial accessory from single source from single manufacturer.

### B. Custodial Mop and Broom Holder:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ASI-American Specialties, Inc.
  - b. Bobrick Washroom Equipment, Inc
  - c. Bradley Corporation
  - d. Brey-Krause Manufacturing Co.
  - e. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
  - f. Tubular Specialties Manufacturing, Inc.
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Four.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
  - a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
  - b. Rod: Approximately 1/4-inch-diameter stainless steel.

## 2.6 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch-minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch-minimum nominal thickness.

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- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- D. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of two keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION OF TOILET, BATH, AND LAUNDRY ACCESSORIES

- A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
  - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 102800

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SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Fire-protection cabinets for the following:
    - a. Portable fire extinguishers.
- B. Related Requirements:
  - 1. Section 104416 "Fire Extinguishers."

1.3 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
    - a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
  - 1. Show location of knockouts for hose valves.
- C. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- D. Samples: For each type of exposed finish required.

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- E. Samples for Initial Selection: For each type of exposed finish required.
- F. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.
- G. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

#### 1.6 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers and fire hose valves indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

#### 1.7 SEQUENCING

- A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

#### 2.2 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher and extinguisher and hose valve.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Fire-End & Croker Corporation.
    - b. GMR International Equipment Corporation.
    - c. Guardian Fire Equipment, Inc.
    - d. JL Industries, Inc.; a division of the Activar Construction Products Group.

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- e. [Larsens Manufacturing Company.](#)
- f. [Modern Metal Products, Division of Technico Inc.](#)
- g. [MOON American.](#)
- h. [Nystrom, Inc.](#)
- i. [Potter Roemer LLC.](#)
- j. [Strike First Corporation of America \(The\).](#)

B. Cabinet Construction: 1-hour fire rated.

- 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet.

- 1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet:

- 1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box to act as drywall bead.
- 2. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

- 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

F. Cabinet Trim Material: Steel sheet.

G. Door Material: Steel sheet.

H. Door Style: Vertical duo panel with frame.

I. Door Glazing: Tempered float glass (clear).

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

- 1. Provide manufacturer's standard.
- 2. Provide concealed hinge permitting door to open 180 degrees.

K. Accessories:

- 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
- 2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

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3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
  - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
    - 1) Location: Applied to cabinet door.
    - 2) Application Process: Pressure-sensitive vinyl letters.
    - 3) Lettering Color: White.
    - 4) Orientation: Vertical.

L. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
  - a. Finish: Baked enamel or powder coat.
  - b. Color: As selected by Architect from full range of industry colors and color densities.
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

## 2.3 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
  1. Weld joints and grind smooth.
  2. Provide factory-drilled mounting holes.
  3. Prepare doors and frames to receive locks.
  4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
  1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
  2. Fabricate door frames of one-piece construction with edges flanged.
  3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## 2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

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- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for hose valves and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
  - 2. Provide inside latch and lock for break-glass panels.
  - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
  - 4. Fire-Rated Hose-Valve Cabinets:
    - a. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.
    - b. Seal through penetrations with firestopping sealant as specified in Section 078413 "Penetration Firestopping."

- C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

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- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION



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SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Requirements:
  - 1. Section 104413 "Fire Protection Cabinets."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
    - a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Warranty: Sample of special warranty.

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1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.7 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10.
    - b. Faulty operation of valves or release levers.
  - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Amerex Corporation.
    - b. Ansul Incorporated; Tyco International.

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- c. [Babcock-Davis.](#)
  - d. [Badger Fire Protection.](#)
  - e. [Buckeye Fire Equipment Company.](#)
  - f. [Fire End & Croker Corporation.](#)
  - g. [Guardian Fire Equipment, Inc.](#)
  - h. [JL Industries, Inc.; a division of the Activar Construction Products Group.](#)
  - i. [Kidde Residential and Commercial Division.](#)
  - j. [Larsens Manufacturing Company.](#)
  - k. [MOON American.](#)
  - l. [Nystrom, Inc.](#)
  - m. [Potter Roemer LLC.](#)
  - n. [Pyro-Chem; Tyco Fire Suppression & Building Products.](#)
  - o. [Strike First Corporation of America \(The\).](#)
- 2. Valves: Manufacturer's standard.
  - 3. Handles and Levers: Manufacturer's standard.
  - 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Wet-Chemical Type: UL-rated 2-A:1-B:C:K, 2.5-gal. nominal capacity, with potassium acetate, citrate, or carbonate-based chemical in stainless-steel container; with pressure-indicating gage.
  - C. Regular Dry-Chemical Type in Steel Container: UL-rated 10-B:C, 5-lb nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.
  - D. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 3-A:40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

## 2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
  - 1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
    - a. [Amerex Corporation.](#)
    - b. [Ansul Incorporated; Tyco International.](#)
    - c. [Babcock-Davis.](#)
    - d. [Badger Fire Protection.](#)
    - e. [Buckeye Fire Equipment Company.](#)
    - f. [Fire End & Croker Corporation.](#)
    - g. [Guardian Fire Equipment, Inc.](#)
    - h. [JL Industries, Inc.; a division of the Activar Construction Products Group.](#)
    - i. [Kidde Residential and Commercial Division.](#)
    - j. [Larsens Manufacturing Company.](#)
    - k. [Nystrom, Inc.](#)
    - l. [Potter Roemer LLC.](#)
    - m. [Pyro-Chem; Tyco Fire Suppression & Building Products.](#)

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- n. Strike First Corporation of America (The).
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
  - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
    - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

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SECTION 111200 – TRAFFIC BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Automatic drop arm traffic barriers.
2. Vehicle detectors.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete bases.
2. Division 26 sections for electrical service and connections for system disconnect switches.
3. Section 281500 "Access Control Hardware Devices" for equipment access devices.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Verify that equipment operation is consistent with system description.
3. Review sequence of operation for each type of parking control equipment.
4. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties.

C. Shop Drawings: For barrier equipment.

1. Include plans, elevations, sections and attachment details.

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2. Include diagrams for power, signal, and control wiring.
3. Vehicle Detectors: Layout and method of placement of vehicle loop detector system.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer.
- C. Field quality-control reports.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For parking control equipment to include in emergency, operation, and maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Manufacturer's Qualifications: A firm experienced in producing traffic barriers similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. 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.
- D. UL Standard: Provide traffic barriers that comply with UL 325.
- E. Comply with ASTM F2200, Class III, for automated traffic barrier construction.

### PART 2 - PRODUCTS

#### 2.1 SYSTEM DESCRIPTION

- A. Traffic Barrier System: Provide factory-assembled automatic operating system designed for barrier size, type, operation, and control indicated, with weatherproof enclosures, safety devices, loop detectors, card readers, intercoms, and remote control stations. Include controlled entry via card reader or radio control and free exit via loop detector.

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## 2.2 SOURCE LIMITATIONS

- A. Obtain traffic barriers from single source from single manufacturer.

## 2.3 AUTOMATIC TRAFFIC BARRIER S

- A. General: Provide traffic barriers consisting of operator and controller housed in a weathertight, tamper-resistant cabinet enclosure with gate arm. Device shall be activated by a signal from access control device. Fabricate unit with gate-arm height in down position of not more than 35 inches above pavement.
  - 1. Basis-of-Design: Basis of Design product is Model M5BAR for double gate arm and M7BAR for single gate arm, manufactured by Nice/Hysecurity. Provide Basis of Design product or approved equal from FAAC, Liftmaster, or Doorking.
  - 2. Standards: Barrier gate operators that are listed and labeled according to UL 325 by a qualified testing agency.
- B. Controller: Factory-sealed, solid-state, plug-in type, with metal box for wiring connections. Communicating type.
  - 1. Communicating Type:
    - a. Real-time communication of status messages and execute commands.
    - b. Status messages for gate up too long, backouts, and gate-arm rebound.
    - c. Communication commands for resetting loops, raising and lowering gate arm, and disabling card readers.
  - 2. Physical Characteristics:
    - a. On-off power supply switch.
    - b. Automatic-manual switch.
    - c. Communication port.
    - d. Thermal-overload protection with manual reset.
    - e. Plug-in connectors for two vehicle loop detectors.
    - f. Thermostatically controlled heater with on/off/auto switch.
    - g. Switch to test motor and limit switches.
    - h. Emergency manual disconnect.
    - i. Battery backup.
  - 3. Operational Characteristics:
    - a. Able to store successive inputs and sequentially processing each one.
    - b. Automatic instant-reversing obstacle detector mechanism that stops downward motion of gate arm if arm contacts or nears an object and that immediately returns arm to upward position. Include a zero- to 60-second, variable-time reset device.
    - c. Broken gate-arm monitoring.
    - d. Diagnostic mode for on-site testing.
    - e. Automatic and continuous testing of inputs and outputs.
    - f. Reversible arm capability for right- or left-handed operation.
- C. Cabinets: Fabricated from sheet metal with seams welded and ground smooth; approximately 15 inches square by 40 inches tall. Provide single, gasketed access door for each cabinet with

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flush-mounted locks. Furnish two keys for each lock, all locks keyed alike. Fabricate cabinet with internal reinforcing and four mounting holes accessible only from inside cabinet.

1. Steel Sheet: Manufacturer's standard steel sheet.
    - a. Finish cabinet, interior and exterior, with manufacturer's standard grey baked-enamel or powder-coat finish.
  2. Aluminum Sheet: Manufacturer's standard aluminum sheet.
    - a. Finish cabinet, interior and exterior, with manufacturer's standard grey baked-enamel or powder-coat finish.
  3. Stainless-Steel Sheet: Manufacturer's standard stainless-steel sheet.
    - a. Finish cabinet exterior with No. 4 finish.
- D. Straight Gate Arm: Manufacturer's standard elliptical aluminum with end caps and rubber impact protection strips.
1. Side Face Finish: Reflective painted finish and red diagonal stripes.
  2. Length: As indicated on Drawings.
  3. Mounting Flange: Provide with breakaway feature to ensure a clean break if arm is struck by vehicle.
- E. Operator: UL labeled and listed, Class III, instant-reversing, continuous-duty motor for operating gate arm. Transmit power to gate-arm drive shaft through the speed reducer to harmonic-acting crank and connecting rod. Fabricate crank, rod, and drive shaft of galvanized solid bar steel. Provide an operable cam for adjusting arm travel.
1. Opening Time: Six seconds maximum.
  2. Inherently adjustable, torque limiting clutch for safety.
- F. Characteristics:
1. 120VAC Input Voltage.
  2. 24VDC operating voltage.
  3. Minimum 200 cycles/hour duty cycle.
  4. Electromechanical Drive.
  5. Audible alarm that activates as part of a safety device system.
  6. Additional obstruction detector; noncontact photoelectric.
  7. Gate-arm warning safety signs on both sides of unit to limit traffic to vehicular traffic.
  8. Low-voltage red warning lights that illuminate when gate is in down position.
  9. Low-voltage light on cabinet top that flashes or changes from red to green when barrier gate is operating.
  10. Manually operated crank for emergency operation.
  11. Authorities having jurisdiction's emergency access.

## 2.4 VEHICLE DETECTORS

- A. General: Provide detection devices that sense presence or transit of vehicles and emit signals activating gate-arm operators.



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- B. Vehicle Loop Detector System: Self-tuning electronic presence detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light. Include automatic closing timer with adjustable time delay before closing designed to hold gate arm open until traffic clears. Provide number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement at location indicated on Drawings, as recommended in writing by detection system manufacturer for pave-over installation, unless indicated otherwise.
  - 1. Field-Assembled Loop: Wire, in size indicated for field assembly.
  - 2. Factory-Formed Loop: Wire, preformed in size indicated.
  - 3. Operation:
    - a. Recognize vehicles within 6 inches of each other on standard-sized loop.
    - b. Recognize vehicle direction by detecting vehicle moving from one loop to another.
    - c. Continuous diagnostic monitoring for intermittently operating and failed loops.
    - d. Crosstalk test between adjacent loops.
- C. Vehicle Presence Detector: Retroreflective or emitter/receiver-type presence detector with adjustable detection zone pattern and sensitivity, designed to detect the presence or transit of vehicle in gate-arm pathway by interrupting infrared beam in zone pattern and to emit signal activating gate-arm operator. Include automatic closing timer with adjustable time delay before closing, timer cut-off switch, and vehicle presence detector designed to hold gate arm open until traffic clears.

## 2.5 ACCESS CONTROL UNITS

- A. Refer to Section 281500 "Integrated Access Control Hardware Devices" for card readers, intercoms, radio control devices, and remote control stations.

## 2.6 ANCHORAGES

- A. Anchor Bolts: Galvanized.
  - 1. Hot-dip galvanized according to ASTM A153/A153M and ASTM F2329/F2329M.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including equipment bases; accurate placement, pattern, and orientation of anchor bolts; critical dimensions; and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical and communication systems to verify actual locations of connections before barrier equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION, GENERAL

- A. Install equipment in accordance with manufacturer's written instructions, as required for complete and integrated installation.
  - 1. Rough-in electrical connections.

3.3 INSTALLATION OF AUTOMATIC TRAFFIC BARRIERS

- A. Anchor cabinets to concrete bases with anchor bolts and mount barrier gate arms.
  - 1. Install barriers according to UL 325.

3.4 INSTALLATION OF VEHICLE DETECTORS

- A. Bury and seal wire loop at locations indicated on Drawings according to manufacturer's written instructions. Connect to control equipment operated by detector.

3.5 INSTALLATION OF CARD READER PEDESTALS

- A. Concrete base mount with anchor bolts, as indicated.

3.6 INSTALLATION OF ELECTRICAL

- A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Equipment will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.8 ADJUSTING

- A. Adjust equipment to function smoothly, and lubricate as recommended by manufacturer.

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- B. Confirm that locks engage accurately and securely without forcing or binding.
- C. After completing installation of exposed, factory-finished equipment, inspect exposed finishes and repair damaged finishes.

3.9 PROTECTION

- A. Remove barrier gate arms during the construction period to prevent damage, and install them immediately before Substantial Completion.

3.10 MAINTENANCE SERVICE

- A. Maintenance Service Description: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of parking control equipment Installer or manufacturer's authorized service representative. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper parking control equipment operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.11 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain parking control equipment.

END OF SECTION

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SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated, single-roller shades.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- C. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- D. Samples: For each exposed product and for each color and texture specified, 10 inches long.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of shadeband material.
- D. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

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- B. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

## 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain roller shades from single source from single manufacturer.

### 2.2 MANUALLY OPERATED, SINGLE-ROLLER SHADES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. BTX Intelligent Fashion, LLC.

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2. [CACO, Inc.](#)
  3. [DFB Sales, Inc.](#)
  4. [Draper, Inc.](#)
  5. Hunter Douglas Architectural Window Coverings.
  6. [Insolroll Window Shading Systems.](#)
  7. [Lafayette Interior Fashions.](#)
  8. [Legrand Shading Systems; Legrand North America, LLC.](#)
  9. Levolor Inc.
  10. Lutron Electronics Co., Inc.
  11. MechoShade Systems, LLC.
  12. Rollease Acmeda Inc.
  13. [Springs Window Fashions; SWFcontract.](#)
- B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
1. Bead Chains: Manufacturer's standard.
    - a. Loop Length: Full length of roller shade.
    - b. Limit Stops: Provide upper and lower ball stops.
    - c. Chain-Retainer Type: Clip, jamb mount.
- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
1. Roller Drive-End Location: Right side of interior face of shade.
  2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
  3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- E. Shadebands:
1. Shadeband Material: Light-filtering fabric.
  2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    - a. Type: Enclosed in sealed pocket of shadeband material.
    - b. Color and Finish: As selected by Architect from manufacturer's full range.
- F. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
    - a. Shape: L-shaped.
    - b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches.

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## 2.3 SHADEBAND MATERIALS

- A. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
  - 1. Source: Roller shade manufacturer.
  - 2. Type: PVC-coated polyester.
  - 3. Weave: Basketweave.
  - 4. Thickness: .037 inch.
  - 5. Weight: 19.35 oz/sq. yd.
  - 6. Roll Width: 48 inches.
  - 7. Orientation on Shadeband: Up the bolt.
  - 8. Openness Factor: 1 percent.
  - 9. Color: As selected by Architect from manufacturer's full range.

## 2.4 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
  - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
  - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

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1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

- B. Roller Shade Locations: At exterior windows.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION



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SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad countertops.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

- B. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

- C. Shop Drawings:

1. Plans, sections, details, edge and backsplash profiles, and attachments to other work.
2. Locations and details of joints.
3. Locations and sizes of cutouts and holes for items installed in countertop.

- D. Samples for Initial Selection: Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

- B. Coordination Drawings: Indicate locations and sizes of cutouts and holes for items installed in countertop and backsplashes.

- C. Qualification Statements: For fabricator.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

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## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.
- B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- C. Keep surfaces of countertops covered with protective covering during handling and installation.

## 1.6 FIELD CONDITIONS

- A. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## PART 2 - PRODUCTS

### 2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Plastic-Laminate-Clad Countertop Type:
- B. Quality Standard: Unless otherwise indicated, comply with ANSI/AWI 1236 for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.
  - 1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that countertops comply with requirements of grade specified.
  - 2. The Contract Documents contain requirements that are more stringent than that of the referenced quality standard. Comply with requirements of the Contract Documents in addition to those of referenced quality standard.
- C. Grade: Custom.
- D. High-Pressure Decorative Laminate: ISO 4586-3, Grade HGS.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABET Inc.
    - b. Formica Corporation.
    - c. Laminart LLC.
    - d. Nevamar Company, LLC.
    - e. Pionite; a Panolam Industries International, Inc. brand.

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f. Wilsonart LLC.

- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
  - 1. As indicated by manufacturer's designations.
  - 2. Match Architect's sample.
  - 3. As selected by Architect from manufacturer's full range in the following categories:
- F. Edge Treatment: As indicated on Drawings.
- G. Core Material: MDF.
- H. Core Material at Sinks: MDF made with exterior glue.
- I. Core Thickness: 3/4 inch.
  - 1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.
- J. Backer Sheet: Provide plastic-laminate backer sheet, ISO 4586-3, grade to match exposed surface, on underside of countertop substrate.

## 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
- B. Composite Panel Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.
  - 1. Medium-Density Fiberboard (MDF): ANSI A208.2, MR 30.
    - a. Grade 130.

## 2.3 MISCELLANEOUS MATERIALS

- A. Adhesive for Bonding Plastic Laminate: Type I, waterproof type as selected by fabricator to comply with requirements.
  - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- B. Installation Adhesive: Manufacturer's standard product that is recommended for application indicated.

## 2.4 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

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- B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
  - 1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify Architect seven days in advance of dates and times countertop fabrication will be complete.
  - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements before disassembling for shipment.
- D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
  - 1. Seal edges of cutouts by saturating with varnish.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates to receive countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Examine shop-fabricated work for completion and complete work as required, including removal of packing.

#### 3.3 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to extent that it was not completed in the shop.

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1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
  2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where indicated on Shop Drawings.
1. Secure field joints in countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten in accordance with manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Countertop Installation:
1. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
  2. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
  3. Anchor wall cleating necessary for proper setting for countertops not supported by casework.
  4. Install countertops level and true in line. Use concealed shims as required to maintain not more than 1/8-inch-in-96-inch variation from a straight, level plane.
  5. Secure backsplashes to walls with adhesive.
  6. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

### 3.4 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where impossible to repair, replace countertops. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semiexposed surfaces.
- C. Protection: Provide kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION

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SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material apron fronts.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For countertop materials.
- C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
  1. Show locations and details of joints.
  2. Show direction of directional pattern, if any.
- D. Samples for Initial Selection: For each type of material exposed to view.
- E. Samples for Verification: For the following products:
  1. Countertop material, 6 inches square.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

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1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Affinity Surfaces; a brand of Domain Industries, Inc.
    - b. Avonite Surfaces; a Brand of Aristech Surfaces LLC.
    - c. DuPont; DuPont de Nemours, Inc.
    - d. Durasein Solid Surface; a brand of Relang International, LLC.
    - e. Formica Corporation.
    - f. LG Hausys, Ltd.
    - g. Lotte Chemical Co., LTD.
    - h. Meganite Inc.
    - i. Swan Surfaces LLC (Swanstone).
    - j. Transolid.
    - k. Wilsonart LLC.
  - 2. Type: Provide Standard type unless Special Purpose type is indicated.
  - 3. Colors and Patterns: As selected by Owner from manufacturer's full range.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

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## 2.2 FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WT's "Architectural Woodwork Standards."
  - 1. Grade: Custom.
- B. Configuration:
  - 1. Front: Straight, slightly eased at top 1-inch laminated bullnose.
  - 2. Backsplash: Straight, slightly eased at corner.
  - 3. End Splash: Matching backsplash.
- C. Countertops:
  - 1. 1/2-inch-thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch-thick, solid surface material.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  - 1. Fabricate with loose backsplashes for field assembly.
  - 2. Install integral sink bowls in countertops in the shop.
- F. Joints:
  - 1. Fabricate countertops in sections for joining in field, with joints at locations indicated.
    - a. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
    - b. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints where indicated. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.
- G. Cutouts and Holes:
  - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
    - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.

## 2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."



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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- E. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
  - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- G. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION

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SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section includes:

1. Sleeves without waterstop.
2. Escutcheons.

1.2 DEFINITIONS

- A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
  - a. Include construction details, material descriptions, and dimensions of components.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Sleeves without Waterstop:

1. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.
2. Steel Sheet Sleeves: ASTM A653/A653M, 24 gauge minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.

B. Silicone Sealants:

1. Silicone Sealant, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, non-traffic use, neutral-curing silicone joint sealant.
  - a. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.

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2.2 ESCUTCHEONS

A. Escutcheon Types:

1. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
2. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES, GENERAL

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.

C. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 INSTALLATION OF ESCUTCHEONS

A. Install escutcheons for exposed piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe and with OD that completely covers opening.

3.3 FIELD QUALITY CONTROL

A. Escutcheons:

1. Using new materials, replace broken and damaged escutcheons.

3.4 SLEEVES APPLICATION

A. Use sleeves for the following piping-penetration applications:

1. Interior Walls and Partitions:
  - a. Sleeves without waterstops.

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3.5 ESCUTCHEONS APPLICATION

A. Escutcheons for New Piping and Relocated Existing Piping:

1. Bare Piping at Exposed Wall Penetrations in Finished Spaces:
  - a. One piece, steel with polished, chrome-plated finish.
  - b. One piece, stamped steel with polished, chrome-plated finish.

END OF SECTION

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SECTION 210529 - HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports for fire-suppression piping - metal.
2. Fastener systems.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING - METAL

A. Pipe Hangers and Supports for Fire-Suppression Piping - Carbon Steel:

1. Description: Factory-fabricated components, NFPA approved, UL listed, or FM Global approved for fire-suppression piping support.
2. Galvanized Metallic Coatings: Pregalvanized or hot-dip galvanized.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.2 FASTENER SYSTEMS

- A. Fastener System - NFPA/UL/FM Powder-Actuated Fasteners: NFPA-approved, UL-listed, or FM Global-approved threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Fastener System - NFPA/UL/FM Mechanical-Expansion Anchors: NFPA-approved, UL-listed, or FM Global-approved, insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

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PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry static loads within specified loading limits. Minimum static design load used for strength determination is to comply with NFPA 13 requirements, minimum 5 times the water-filled weight of piping and supported components plus 250 lb.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. Install hangers and supports to allow controlled thermal movement of piping systems, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- B. Install lateral bracing with pipe hangers and supports to prevent swaying.
- C. Install building attachments within concrete slabs or attach to structural steel.
- D. Metal Pipe-Hanger Installation: Comply with installation requirements of approvals and listings. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- E. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners in accordance with powder-actuated tool manufacturer's operating manual. Install in accordance with approvals and listings.
  - 2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners in accordance with manufacturer's written instructions. Install in accordance with approvals and listings.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

3.3 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.

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3.4 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with NFPA requirements for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.
- D. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- E. Horizontal-Piping Hangers and Supports: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
  - 2. Steel Pipe Clamps (MSS Type 4): For suspension of NPS 1/2 to NPS 24 if little or no insulation is required.
  - 3. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
  - 4. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
- F. Hanger-Rod Attachments: Comply with NFPA requirements.
- G. Building Attachments: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  - 2. C-Clamps (MSS Type 23): For structural shapes.
  - 3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- H. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

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SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe labels.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

PART 2 - PRODUCTS

2.1 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.
- B. Letter and Background Color: As indicated for specific application under Part 3.
- C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include the following:
  1. Flow-Direction Arrows: Include flow-direction arrows on distribution piping. Arrows may be either integral with label or applied separately.
  2. Lettering Size: At least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.



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PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION GENERAL REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF PIPE LABELS

- A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.
- 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. Within 3 ft. of each valve and control device.
  - 2. At access doors, manholes, and similar access points that permit a view of concealed piping.
  - 3. Within 3 ft. of equipment items and other points of origination and termination.
  - 4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping and equipment.
- C. Flow- Direction Arrows: Provide arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- D. Fire-Suppression Pipe Label Color Schedule:
  - 1. Fire-Suppression Pipe Labels: White letters on an ANSI Z535.1 safety-red background.

END OF SECTION

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SECTION 211000 - WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-suppression piping, fittings, and appurtenances.
2. System control valves.
3. Fire-suppression piping specialties.
4. Sprinklers.

1.2 DEFINITIONS

- A. Standard-Pressure Fire-Suppression System Piping: Piping designed to operate at working pressure of 175 psig maximum.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
  - a. Include construction details, material descriptions, dimensions of individual components and profiles.
  - b. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings:

1. Prepare in accordance with NFPA 13 section "Working Plans."
  - a. Include plans, elevations, and sections of the system piping and details.
  - b. Include detailed riser diagram and schematic diagram showing system supply, supply connection, devices, valves, pipe and fittings.
  - c. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Prepare computer-generated hydraulic calculations in accordance with the following:
  - a. Name of hydraulic program used.
  - b. Water supply information, including fire hydrant flow test data report.

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3. Submit documents. NICET certified-technician submittals are to include the following information on each drawing title block: technician's name, NICET certification number, and NICET certification specialty area and level.
- D. Delegated Design Submittals: For fire-suppression systems indicated to comply with performance requirements and design criteria, including analysis data. NICET certified-technician submittals are to include the following information on each drawing title block: technician's name, NICET certification number, and NICET certification specialty area and level.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Coordination Drawings: Fire-suppression system plans and sections, drawn to scale, showing the items described in this Section and coordinated with all building trades.
- C. Qualification Data: For qualified Installer and NICET-certified technician.
- D. Design Data: Approved fire-suppression piping working plans, prepared in accordance with NFPA 13, including documented approval by AHJs, and including hydraulic calculations if applicable.
- E. Field Test Reports:
  1. 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."
  2. Fire-hydrant flow test report.
- F. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For fire-suppression systems and specialties to include in emergency, operation, and maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

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1.7 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. Base calculations on results of fire-hydrant flow test performed for the work of this contract.
  - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by NICET Level IV-certified technician, "Water-Based Systems Layout."

1.8 FIELD CONDITIONS

- A. Interruption of Existing Fire-Suppression Service: Do not interrupt fire-suppression service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fire-suppression service in accordance with requirements indicated:
1. Notify Owner no fewer than seven days in advance of proposed interruption of fire-suppression service.
  2. Do not proceed with interruption of fire-suppression service without Owner's written permission.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Modifications to an existing automatic wet-pipe sprinkler system.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Suppression System Components, Devices, and Accessories: Listed in UL's "Fire Protection Equipment Directory" and FM Approvals' "Approval Guide."
- B. Fire-suppression system equipment, specialties, accessories, installation, and testing to comply with NFPA 13.
- C. Standard-Pressure Piping System Component: Listed for 175 psig minimum working pressure.
- D. Sprinkler Occupancy Hazard Classifications:
  1. General Storage Areas: Ordinary Hazard, Group 1.
  2. Offices, including Data Processing: Light Hazard.
  3. Minimum Density for Automatic-Sprinkler Piping Design:
    - a. Light-Hazard Occupancy: 0.10 gpm/sq. ft. over 1500 sq. ft. area.
    - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm/sq. ft. over 1500 sq. ft. area.

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4. Maximum Protection Area per Sprinkler:
  - a. Office Spaces: 225 sq. ft.
  - b. Storage Areas: 130 sq. ft.
  - c. Other Areas: In accordance with NFPA 13 recommendations unless otherwise indicated.

E. Obtain documented approval of fire-suppression system design from AHJs.

## 2.3 FIRE-SUPPRESSION PIPING, FITTINGS, AND APPURTENANCES

### A. Steel Pipe, Fittings, and Appurtenances:

1. Schedule 40 Steel Pipe: Black-steel pipe, ASTM A53/A53M, ASTM A135/A135M, or ASTM A795/A795M.
  - a. Standards:
    - 1) UL 852.
    - 2) FM 1630.
  - b. Factory-applied exterior coating.
  - c. Factory-applied bacterial-resistant internal coating to reduce microbiologically influenced corrosion.
  - d. Pipe ends may be factory or field formed to match joining method.
2. Steel Pipe Nipples: Black steel, ASTM A733, made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.
3. Gray-Iron Threaded Fittings: Uncoated gray-iron threaded fittings, ASME B16.4, Class 125, standard pattern.
4. Malleable- or Ductile-Iron Unions: ASME B16.3.
5. Grooved-Joint, Steel-Pipe Appurtenances:
  - 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) CPS Products, Inc.
    - 2) Gruylok; an ASC Engineered Solution.
    - 3) Shurjoint; a part of Aalberts Integrated Piping Systems.
    - 4) Smith-Cooper International.
    - 5) SPF/Anvil; an ASC Engineering Solution.
    - 6) Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
    - 7) Victaulic Company.
  - b. Pressure Rating: 175 psig minimum.
  - c. Grooved-End Fittings for Steel Piping: Uncoated grooved-end fittings, ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting, with dimensions matching steel pipe.

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- d. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

## 2.4 FIRE-SUPPRESSION PIPING SPECIALTIES

### A. Branch Outlet Fittings:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Shurjoint; a part of Aalberts Integrated Piping Systems.
  - b. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
  - c. Victaulic Company.
2. Standard: UL 213.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

- B. Flexible Expansion Loop: Prefabricated flexible loop listed for fire protection service with two sections of metal hose and braid connected with 180 degree return elbow and provided with two 90 degree elbows. Return elbow shall be provided with drain/air plug and center support nut.

## 2.5 SPRINKLERS

- 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. Reliable Automatic Sprinkler Co., Inc. (The).
2. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
3. Victaulic Company.
4. Viking Group Inc.

### B. Standards:

1. UL 199.
2. UL 1767.
3. FM 2000.

- C. Listed in UL's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."

- D. Pressure Rating for Sprinklers:

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1. Standard Automatic Sprinklers: 175 psig minimum.
- E. Sprinklers, Automatic Wet with Heat-Responsive Element:
1. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
  2. Standard Spray, Standard Response:
    - a. Upright.
    - b. Pendent.
    - c. Recessed pendent.
    - d. Flat, concealed pendent.
    - e. Flat, concealed horizontal sidewall.
  3. Standard Spray, Quick Response:
    - a. Upright.
    - b. Pendent.
    - c. Recessed pendent.
    - d. Flat, concealed pendent.
    - e. Flat, concealed horizontal sidewall.
- F. Sprinkler Finishes: White painted, brass concealed plate for wood ceiling application
- G. 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: White finish, one piece, flat.
  2. Sidewall Mounting: White finish, one piece, flat.
- H. Sprinkler Guards and Water Shields:
1. Standard: UL 199.
  2. Description: Wire cage with fastening device for attaching to sprinkler.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Perform fire-hydrant flow test or obtain updated flow testing results from the municipal water department. Use results for system design calculations required in "Quality Assurance" Article.
1. Flow test is to be performed to meet the criteria established by NFPA 13.
  2. Flow test is to be conducted in accordance with NFPA 291.
  3. Test is to be performed during a period of ordinary demand for the water system.
    - a. To obtain satisfactory test results of expected flow or rated capacities, sufficient discharge should be achieved to cause drop of at least 10 percent.

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4. Pitot readings are to be taken at the 2-1/2-inch orifice connection.
5. The pitot reading is to range from 10 to 35 psig.
6. Open additional hydrant outlets as needed to control pitot readings.
7. The pitot pressure and corresponding residual pressure readings are to be taken consecutively as pressure fluctuates between a high number and low number.

B. Flow Test Data Written Report:

1. Flow data report is to be written in accordance with NFPA 291.
2. Flow data report is to include a copy of all flow data recorded during the test, including a site plan showing the tested fire hydrants with respect to the fire water service to the building. Site plan is to indicate which hydrant was flowed and which hydrant was used for pressure reading. Provide date of test, name of testing agency, and name of individual performing test.

C. Water Supply Curve: Provide water supply curve based on the lowest supply for a given set of test data. For a given residual pressure reading, the supply is to be graphed utilizing the corresponding pitot pressure/flow reading and static pressure reading.

D. Documentation is to include calibration certifications for gauges used in the flow tests. The certifications are to be from within the previous six (6) months from a reputable agency recognized for certifying pressure gauges.

E. Report flow test results promptly and in writing. A copy of the flow test data report is to be submitted with the hydraulic calculations.

### 3.2 INSTALLATION OF FIRE-SUPPRESSION PIPING

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from AHJs. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of fire-suppression piping.

C. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install fire-suppression system piping with drains for complete system drainage. Extend drain piping to exterior of building where possible.

E. Install hangers and supports for fire-suppression piping in accordance with NFPA standards. Comply with requirements for hanger materials in NFPA standards.

F. Fill wet-type fire-suppression system piping with water.

G. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210500 "Common Work Results for Fire-Suppression Piping."



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- H. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210500 "Common Work Results for Fire-Suppression Piping."
- I. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210500 "Common Work Results for Fire-Suppression Piping."

### 3.3 INSTALLATION OF PIPING JOINTS

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- 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 pipes, tubes, and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads in accordance with 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.
- E. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe joints.
- F. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe grooved joints.
- G. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

### 3.4 INSTALLATION OF SPRINKLERS

- A. Install sprinklers in suspended ceilings symmetrically in center of narrow dimension of acoustical ceiling panels or wood slats within tolerance of 1/2 inch. Coordinate entire pattern of sprinkler locations with approved reflected ceiling plan.

### 3.5 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping in accordance with requirements for identification specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment."

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3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Perform the following tests and inspections:
  - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Flush, test, and inspect fire-suppression systems in accordance with NFPA standards.
  - 3. Coordinate with fire-alarm tests. Operate as required.
  - 4. Verify that sprinklers original factory finish has not been contaminated with dirt, debris, or paint. Sprinklers containing other-than-original factory finish are to be considered defective and replaced with new products. Repair and/or cleaning is not acceptable.
- C. Fire-suppression piping system will be considered defective if it does not pass tests and inspections.
- D. Fire-suppression piping system components considered defective during testing will be replaced with new components. Repair of defective components is not acceptable.
- E. Prepare test and inspection reports.

3.7 CLEANING

- A. Clean dirt and debris from fire-suppression system piping, sprinklers, and associated components.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.8 PIPING SCHEDULE

- A. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 2 (DN 50) and Smaller, to Be One of the Following:
  - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
  - 2. Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- B. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), to Be One of the Following:
  - 1. Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.9 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:

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1. Rooms without Ceilings: Upright sprinklers.
  2. Rooms with Suspended Ceilings: Pendent sprinklers.
  3. Wall Mounting: Horizontal sidewall sprinklers.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
1. Upright, Pendent, and Sidewall Sprinklers: Factory-painted white in finished spaces exposed to view; rough bronze in unfinished spaces and locations not generally exposed to view; brass finish in wood ceiling.

END OF SECTION

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SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Motors.
2. Sleeves without waterstop.
3. Sleeve-seal systems.
4. Escutcheons.

1.2 DEFINITIONS

- A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied..
  - a. Include construction details, material descriptions, and dimensions of individual components, and finishes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Compatibility: Provide products suitable for piping service fluids, materials, working pressures, and temperatures.

2.2 MOTORS

A. Motor Requirements, General:

1. Content includes motors for use on alternating-current power systems of up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

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2. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
3. Comply with NEMA MG 1 unless otherwise indicated.

B. Motor Characteristics:

1. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 ft. above sea level.
2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Single-Phase Motors:

1. Motors larger than 1/20 hp must be one of the following, to suit starting torque and requirements of specific motor application:
  - a. Permanent-split capacitor.
2. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
3. Motors 1/20 HP and Smaller: Shaded-pole type.
4. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device will automatically reset when motor temperature returns to normal range.

## 2.3 SLEEVES AND SLEEVE SEALS

A. Sleeves without Waterstop:

1. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.
2. Steel Sheet Sleeves: ASTM A653/A653M, 24 gauge minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.

B. Sleeve-Seal Systems:

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, LLC.
  - b. GPT; a division of EnPRO Industries.
  - c. Metraflex Company (The).
  - d. Proco Products, Inc.
2. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - a. Hydrostatic Seal: 20 psig minimum.

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- b. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- c. Pressure Plates: Carbon steel or composite plastic.
- d. Connecting Bolts and Nuts: Carbon steel, with zinc coating, ASTM B633 of length required to secure pressure plates to sealing elements.

C. Grout:

- 1. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
- 2. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- 3. Design Mix: 5000 psi, 28-day compressive strength.
- 4. Packaging: Premixed and factory packaged.

D. Silicone Sealants:

- 1. Silicone Sealant, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
  - a. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.

## 2.4 ESCUTCHEONS

A. Escutcheon Types:

- 1. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- 2. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel or brass with polished, chrome-plated finish and spring-clip fasteners.
- 3. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF SLEEVES - GENERAL

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
  - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Using grout or silicone sealant, seal the space outside of sleeves in floors/slabs/walls. Select to maintain fire resistance of floor/slab/wall.

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- 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 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.
- E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

### 3.2 INSTALLATION OF SLEEVE-SEAL SYSTEMS

- A. Install sleeve-seal systems in sleeves in slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

### 3.3 INSTALLATION OF ESCUTCHEONS

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

### 3.4 FIELD QUALITY CONTROL

- A. Escutcheons:
  - 1. Using new materials, replace broken and damaged escutcheons and floor plates.

### 3.5 SLEEVES APPLICATION

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
  - 1. Concrete Slabs-on-Grade:
    - a. Sleeves without waterstops.
      - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
  - 2. Interior Wall and Partitions and Concrete Slabs Above Grade:

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- a. Sleeves without waterstops.

3.6 ESCUTCHEONS APPLICATION

A. Escutcheons for New Piping and Relocated Existing Piping:

- 1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
- 2. Chrome-Plated Piping: One piece, steel or cast brass with polished, chrome-plated finish.
- 3. Insulated Piping:
  - a. One piece, cast brass with polished, chrome-plated finish.
  - b. One piece, stamped steel with polished, chrome-plated finish.
- 4. Bare Piping in Unfinished Service Spaces:
  - a. One piece, cast brass with polished, chrome-plated finish.
  - b. One piece, stamped steel with polished, chrome-plated finish.

END OF SECTION



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SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ball valves.
2. Check valves.

1.2 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer.
- C. PTFE: Polytetrafluoroethylene.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
    - a. Include material descriptions and dimensions of individual components.
    - b. Include operating characteristics and furnished accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
  2. Protect threads.
  3. Set ball valves open to minimize exposure of functional surfaces.
  4. 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.

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PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of valve from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic-water piping valves intended to convey or dispense water for human consumption must comply with the U.S. Safe Drinking Water Act (SDWA), requirements of authorities having jurisdiction, and NSF 61/NSF 372; or to be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.22 for wrought-copper solder-joint connections.
3. ASME B16.34 for threaded-end connections.
4. ASME B31.9 for building services piping valves.

- C. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are unacceptable.

- D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

- E. Valve Sizes: Same as upstream piping unless otherwise indicated.

F. Valve Actuator Type:

1. Hand Lever: For quarter-turn ball valves smaller than NPS 4.

G. Valves in Insulated Piping:

1. Provide 2-inch extended neck stems.
2. Provide extended operating handles with nonthermal-conductive covering material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Provide memory stops that are fully adjustable after insulation is applied.

2.3 BALL VALVES, LEAD FREE

- A. Ball Valves, Lead Free, Threaded or Soldered Ends - Bronze, Two Piece with Full Port and Stainless Steel Trim:

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Apollo Valves; p art of Aalberts Integrated Piping Systems.
  - b. Hammond Valve.
  - c. Jenkins Valves; a Crane Co. brand.
  - d. Milwaukee Valve Company.
  - e. NIBCO INC.
  - f. Red-White Valve Corp.
  - g. Stockham; a Crane Co. brand.
  - h. WATTS; A Watts Water Technologies Company.
2. Standards: MSS SP-110 and MSS SP-145.
3. CWP Rating: 600 psig.
4. Body Design: Two piece.
5. Body Material: Bronze.
6. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
7. Seats: PTFE.
8. Stem: Stainless steel.
9. Ball: Stainless steel, vented.
10. Port: Full.

#### 2.4 CHECK VALVES, LEAD FREE

A. Check Valves, Lead Free, Swing Type, Threaded or Soldered Ends - Bronze, with Nonmetallic Disc, Class 125:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Apollo Valves; p art of Aalberts Integrated Piping Systems.
  - b. Crane Fluid Systems; Crane Co.
  - c. Jenkins Valves; a Crane Co. brand.
  - d. Lance Valves.
  - e. Milwaukee Valve Company.
  - f. NIBCO INC.
  - g. Red-White Valve Corp.
  - h. Stockham; a Crane Co. brand.
2. Standard: MSS SP-80, Type 4.
3. CWP Rating: 200 psig.
4. Body Design: Horizontal flow.
5. Body Material: ASTM B62, bronze.
6. Ends: Threaded or soldered. See Part 3 check valve schedule articles.
7. Disc: PTFE.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Do not attempt to repair defective valves; replace with new valves. Remove defective valves from site.

3.2 INSTALLATION OF VALVES

- A. Provide support of piping adjacent to valves such that no force is imposed upon valves.
- B. Locate valves for easy access and where not blocked by equipment, other piping, or building components.
- C. For valves in horizontal piping, install valves with stem at or above center of pipe.
- D. Install valves in position that does not project into aisles or block access to other equipment.
- E. Install valves in position to allow full stem manual operator movement.
- F. Verify that joints of each valve have been properly installed and sealed to assure there is no leakage or damage.
- G. Install check valves for proper direction of flow and as follows:
  - 1. Check Valves, Swing Type: In horizontal position with hinge pin level.
- H. Valve Tags: Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
- I. Adhere to manufacturer's written installation instructions. When soldering or brazing valves, do not heat valves above maximum permitted temperature. Do not use solder with melting point temperature above valve manufacturer's written recommended maximum.

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.

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3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
  - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

3.5 DOMESTIC HOT- AND COLD-WATER BALL VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
  - 1. Ball valves, lead free, threaded or soldered ends - bronze, two piece with full port and stainless steel trim; threaded or soldered ends.

3.6 DOMESTIC HOT- AND COLD-WATER CHECK VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
  - 1. Check valves, lead free, swing type, threaded or soldered ends - bronze, with nonmetallic disc, Class 125; threaded or soldered ends.

END OF SECTION

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SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports - metal.
2. Strut support systems - metal, rod type.
3. Thermal hanger-shield inserts.
4. Fastener systems.
5. Pipe-positioning systems.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS - METAL

A. Pipe Hangers and Supports - Carbon Steel:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.2 STRUT SUPPORT SYSTEMS - METAL, ROD TYPE

- 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. ABB, Electrification Business.
  2. Anvil; an ASC Engineered Solution.
  3. B-Line; a division of Eaton, Electrical Sector.
  4. CADDY; brand of nVent Electrical plc.
  5. Carpenter & Paterson, Inc.
  6. Empire Industries, Inc.

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7. Flex-Strut Inc.
  8. G-Strut.
  9. Hyadon Corporation.
  10. PHD Manufacturing, Inc.
- B. Description: Factory-fabricated pipe-support assembly, made of steel channels, vertical metal support rods, accessories, fittings, and other components for supporting multiple parallel pipes.
- C. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
- D. Struts: Continuous slotted carbon steel channel with inturned lips.
- E. Strut Width: Selected for applicable load criteria.
- F. Strut Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
- G. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- H. Metallic Coating: Pregalvanized G90 or electroplated zinc.

### 2.3 THERMAL HANGER-SHIELD INSERTS

- 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. Buckaroos, Inc.
  2. Carpenter & Paterson, Inc.
  3. KB Enterprise.
  4. National Pipe Hanger Corporation.
  5. Pipe Shields Inc.
  6. Piping Technology & Products, Inc.
  7. Rilco Manufacturing Co., Inc.
  8. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Cold and Hot Piping: ASTM C552, Type II cellular glass with 100 psig or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125 psig minimum compressive strength and vapor barrier.
- C. For Clamped Systems: Insert and shield are to cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield are to cover bottom 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

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## 2.4 FASTENER SYSTEMS

- A. Fastener System - Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities required for supported loads and building materials where used.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Hilti, Inc.
    - b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - c. MKT Fastening, LLC.
- B. Fastener System - Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities required for supported loads and building materials where used.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. B-line; a division of Eaton, Electrical Sector.
    - b. Empire Industries, Inc.
    - c. Hilti, Inc.
    - d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - e. MKT Fastening, LLC.
  - 2. Indoor Applications: Zinc-plated steel.

## 2.5 PIPE-POSITIONING SYSTEMS

- A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination is to include weight of supported components plus 200 lb.



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### 3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. Install hangers and supports to allow controlled thermal movement of piping systems.
- B. Install building attachments within concrete slabs or attach to structural steel.
- C. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- D. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- E. Insulated Piping:
  - 1. Attach clamps and spacers to piping, with the following exceptions:
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
  - 2. Install MSS SP-58, Type 40, protective shields on hot piping and cold piping with vapor barrier. Shields are to span an arc of 180 degrees.
  - 3. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches long and 0.048 inch thick.
- F. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- G. Strut System Installation: Metal; arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- H. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.
- I. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick after concrete is placed and cured. Use installers that are licensed by powder-actuated tool manufacturer.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners in accordance with manufacturer's written instructions.
  - 3. Install lag screw wood fasteners in accordance with manufacturer's written instructions.
  - 4. Install fasteners in accordance with manufacturer's written instructions.
- J. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- K. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

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### 3.3 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.

### 3.4 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.
- D. Use carbon-steel pipe hangers and supports and metal framing systems and attachments for general service applications.
- E. Use thermal hanger-shield inserts for insulated piping and tubing.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
  - 2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
  - 3. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
  - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
- G. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  - 2. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  - 3. C-Clamps (MSS Type 23): For structural shapes.
  - 4. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
- H. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

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3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.
  - I. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
  - J. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

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SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe labels.
2. Valve tags.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product indicated. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
- C. Valve Schedules: For each piping system. Include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.
- B. Letter and Background Color: As indicated for specific application under Part 3.
- C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include:
  1. Flow-Direction Arrows: Include flow-direction arrows on distribution piping. Arrows may be either integral with label or applied separately.
  2. Lettering Size: At least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.

2.2 VALVE TAGS

- A. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

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1. Tag Material: Brass, 0.04-inch or aluminum, 0.031-inch minimum thickness, with predrilled or stamped holes for attachment hardware.
  2. Fasteners: Brass link chain or beaded chain.
- B. Letter and Background Color: As indicated for specific application under Part 3.
- C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Include valve-tag schedule in operation and maintenance data.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

#### 3.2 INSTALLATION, GENERAL 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.
- D. Locate identifying devices so that they are readily visible from the point of normal approach.

#### 3.3 INSTALLATION OF PIPE LABELS

- A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.
- 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. Within 3 ft. of each valve and control device.
  2. At access doors, manholes, and similar access points that permit view of concealed piping.
  3. Within 3 ft. of equipment items and other points of origination and termination.
  4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping and equipment.
- C. Flow-Direction Flow Arrows: Use arrows, in compliance with ASME A13.1, to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

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D. Pipe-Label Color Schedule:

1. Domestic Cold-Water Piping: White letters on an ANSI Z535.1 safety-green background.
2. Domestic Hot-Water Piping: White letters on an ANSI Z535.1 safety-green background
3. Domestic Hot-Water Return Piping White letters on an ANSI Z535.1 safety-green background.
4. Sanitary Waste and Storm Drainage Piping: White letters on a black background.

3.4 INSTALLATION OF VALVE TAGS

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule in the operating and maintenance manual.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:
1. Valve-Tag Size and Shape: 1-1/2 inches, round.
  2. Valve-Tag Colors:
    - a. For each piping system, use the same lettering and background coloring system on valve tags as used in the piping system labels and background.

END OF SECTION

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SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following plumbing piping services:
  - 1. Domestic cold-water piping.
  - 2. Domestic hot-water piping.
  - 3. Domestic recirculating hot-water piping.
  - 4. Roof drains and rainwater leaders.
  - 5. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any). On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
- C. Insulation Schedule: Identify type of material, thickness, vapor barrier provision, and where required field-applied jacket to be provided for each system application.

1.3 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.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation system materials are to be delivered to the Project site in unopened containers. The packaging is to include name of the manufacturer, fabricator, type, description, and size.

1.5 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

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1.6 SCHEDULING

- A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

- 1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General" and "Indoor Piping Insulation Schedule" articles for where insulating materials are applied.
- B. Products do not contain asbestos, lead, mercury, or mercury compounds.
- C. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.
- D. Flexible Elastomeric: Closed-cell or expanded-rubber materials; suitable for maximum use temperature between minus 70 deg F and 220 deg F. Comply with ASTM C534/C534M, Type I for tubular materials.

- 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. Aeroflex USA.
- b. Armacell LLC.
- c. K-Flex USA.

- E. Glass-Fiber, Preformed Pipe: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 850 deg F in accordance with ASTM C411. Comply with ASTM C547.

- 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. Johns Manville; a Berkshire Hathaway company.
- b. Knauf Insulation.
- c. Manson Insulation Inc.



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d. Owens Corning.

2. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ-SSL.
3. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
4. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.3 ADHESIVES

A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Solvent-based adhesive.

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. Aeroflex USA.
- b. Armacell LLC.
- c. Foster Brand; H. B. Fuller.
- d. K-Flex USA.

2. Adhesive: As recommended by flexible elastomeric and polyolefin manufacturer and with a VOC content of 80 g/L or less.
3. Flame-spread index is 25 or less and smoke-developed index is 50 or less as tested in accordance with ASTM E84.
4. Wet Flash Point: Below 0 deg F.
5. Service Temperature Range: 40 to 200 deg F.
6. Color: Black.

C. Glass-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade 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. Childers Brand; H. B. Fuller Construction Products.
- b. Foster Brand; H. B. Fuller.
- c. Mon-Eco Industries, Inc.

2. Adhesive: As recommended by mineral fiber manufacturer and with a VOC content of 80 g/L or less.

D. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Childers Brand; H. B. Fuller Construction Products.
- b. Foster Brand; H. B. Fuller.

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- c. [Mon-Eco Industries, Inc.](#)
- 2. [Verify adhesives have a VOC](#) content of 80 g/L or less.

## 2.4 MASTICS AND COATINGS

- A. Materials are compatible with insulation materials, jackets, and substrates.
  - 1. [Mastics](#): As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.
- B. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.
  - 1. [Manufacturers](#): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. [Childers Brand; H. B. Fuller Construction Products.](#)
    - b. [Foster Brand; H. B. Fuller.](#)
    - c. [Knauf Insulation.](#)
    - d. [Mon-Eco Industries, Inc.](#)
    - e. [Vimasco Corporation.](#)
  - 2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
  - 3. Service Temperature Range: 0 to plus 180 deg F.
  - 4. Comply with MIL-PRF-19565C, Type II, for permeance requirements.
  - 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
  - 1. [Manufacturers](#): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. [Childers Brand; H. B. Fuller Construction Products.](#)
    - b. [Foster Brand; H. B. Fuller.](#)
    - c. [Knauf Insulation.](#)
    - d. [Mon-Eco Industries, Inc.](#)
    - e. [Vimasco Corporation.](#)
  - 2. Water-Vapor Permeance: ASTM E96/E96M, greater than 1.0 perm at manufacturer's recommended dry film thickness.
  - 3. Service Temperature Range: 0 to plus 180 deg F.
  - 4. Color: White.

## 2.5 SEALANTS

- A. Materials are as recommended by the insulation manufacturer and are compatible with insulation materials, jackets, and substrates.
- B. Joint Sealants:

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Childers Brand; H. B. Fuller Construction Products.
  - b. Foster Brand; H. B. Fuller.
  - c. Mon-Eco Industries, Inc.
  - d. Owens Corning.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 58 to plus 176 deg F.
4. Color: White or gray.
5. Verify sealant has a VOC content of 420 g/L or less.

C. ASJ Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Childers Brand; H. B. Fuller Construction Products.
  - b. Foster Brand; H. B. Fuller.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. Verify sealant has a VOC content of 420 g/L or less.

## 2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
  2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

## 2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets comply with ASTM C1136, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
  1. Adhesive: As recommended by jacket material manufacturer.
  2. Color: White.
  3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

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- a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

## 2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

- 1. Width: 3 inches.

## 2.9 SECUREMENTS

- A. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

## 2.10 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:

- 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. Buckaroos, Inc.
  - b. Just Manufacturing.
  - c. McGuire Manufacturing.
  - d. Plumberex Specialty Products, Inc.
  - e. Truebro; IPS Corporation.
  - f. Zurn Industries, LLC.
- 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.
- E. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.
- F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- G. Install insulation with least number of joints practical.
- H. 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 attached to structure with vapor-barrier mastic.
  - 3. Install insert materials and 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.
- I. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- J. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
  - 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.

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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 4 inches o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
  5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- K. Cut insulation in a manner to avoid compressing insulation.
- L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- M. 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 in similar fashion to butt joints.
- N. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
  2. Testing agency labels and stamps.
  3. Nameplates and data plates.
  4. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
  2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.
- B. Insulation Installation on Fittings, and Valves:

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1. Install insulation over fittings, valves, 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 that of adjacent pipe insulation. Each piece is butted tightly against adjoining piece and bonded with adhesive.
3. Insulate tee fittings with sectional pipe insulation of same material and thickness as that 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 that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 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.
5. For services not specified to receive a field-applied jacket, except for flexible elastomeric, install fitted PVC cover over elbows, tees, and valves. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.

### 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Fittings and Elbows:
  1. Install sections of pipe insulation and miter if required in accordance with manufacturer's written instructions.
  2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Valves and Pipe Specialties:
  1. Install prefabricated valve covers manufactured of same material as that of pipe insulation when available.
  2. When prefabricated 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. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.7 INSTALLATION OF GLASS-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
  1. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  2. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
  3. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

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B. Insulation Installation on Pipe Fittings and Elbows:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated 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.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated sections are not available, install fabricated sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3.8 INSTALLATION OF FIELD-APPLIED JACKETS

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.9 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

3.11 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. Underground piping.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation is the following:



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- a. Flexible Elastomeric: 3/4 inch thick above ceilings or exposed, and 1/2 inch thick within interior partitions and plumbing chases.
- 2. NPS 1-1/4 and Larger: Insulation is the following:
  - a. Flexible Elastomeric: 1 inch thick.
- B. Domestic Hot and Recirculated Hot Water:
  - 1. NPS 1-1/4 and Smaller: Insulation is the following:
    - a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick within interior partitions and plumbing chases and 1-inch thick where exposed or above ceilings.
- C. Stormwater and Overflow:
  - 1. All Pipe Sizes: Insulation is one of the following:
    - a. Flexible Elastomeric: 1 inch thick.
    - b. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- D. Roof Drain and Overflow Drain Bodies:
  - 1. All Pipe Sizes: Insulation is the following:
    - a. Flexible Elastomeric: 1 inch thick.

END OF SECTION

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SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings - domestic water.
2. Piping joining materials - domestic water.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. System purging and disinfecting activities report.
- C. Field quality-control reports.

1.4 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service in accordance with requirements indicated:
  1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
  2. Do not interrupt water service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Domestic water piping, tubing, fittings, joints, and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party

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certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PIPING MATERIALS

- A. Potable-water piping and components are to comply with NSF 14, NSF 61, and NSF 372.

2.3 COPPER TUBE AND FITTINGS - DOMESTIC WATER

- A. Drawn-Temper Copper Tube: ASTM B88, Type L.
- B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4.

2.4 PIPING JOINING MATERIALS - DOMESTIC WATER

- A. Solder Filler Metals: ASTM B32, lead-free alloys.
- B. Flux: ASTM B813, water flushable.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Aboveground domestic water piping, NPS 2 (DN 50) and smaller is to be the following:
  - 1. Drawn-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

3.2 INSTALLATION OF PIPING

- 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 in accordance with CDA's "Copper Tube Handbook."
- C. Install valves in accordance with Section 220523 "General-Duty Valves for Plumbing Piping."
- D. Install domestic water piping level and plumb.
- E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- F. 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.

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- G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- H. Install piping to permit valve servicing.
- I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- M. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

### 3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- 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 in accordance with 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. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings in accordance with ASTM B828 or CDA's "Copper Tube Handbook."

### 3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for hangers, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Install hangers for copper pipe, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping within 12 inches of each fitting.
- D. Support vertical runs of copper pipe to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

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3.5 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  - 1. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3.6 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 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 in accordance with either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.8 ADJUSTING

- A. Perform the following adjustments before operation:

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1. Open shutoff valves to fully open position.
2. Open throttling valves to proper setting.
3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
  - a. Adjust calibrated balancing valves to flows indicated.
4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.9 FIELD QUALITY CONTROL

#### A. Tests and Inspections:

1. Piping Inspections:
  - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
  - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after installation and before setting fixtures.
    - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
  - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
  - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
  - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
  - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
  - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
  - f. Prepare reports for tests and for corrective action required.

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- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION

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SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing valves.
2. Water-temperature limiting devices.
3. Water-hammer arresters.
4. Trap-seal primer device.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

1.3 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For domestic water piping specialties to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.



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## 2.3 BALANCING VALVES

### A. Automatic Flow Control Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Caleffi North America.
  - b. IMI Hydronic Engineering Inc.
  - c. ThermOmegaTech.
2. Flow Regulation: Plus or minus 5 percent over 95 percent of the working range.
3. Pressure Rating: 200 psig.
4. Size: NPS 2 or smaller.
5. Body: Stainless steel or brass.
6. Flow Cartridge: Stainless steel or antiscaling polymer.
7. End Connections: Threaded or solder joint.

## 2.4 WATER-TEMPERATURE LIMITING DEVICES

### A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Acorn Controls; a Division of Morris Group International.
  - b. Acorn Engineering Company; a Division of Morris Group International.
  - c. Apollo Valves; a part of Aalberts Integrated Piping Systems.
  - d. Cash Acme Plumbing Products; an RWC brand.
  - e. POWERS; A Watts Water Technologies Company.
  - f. Symmons Industries, Inc.
  - g. Taco Comfort Solutions.
  - h. WATTS; A Watts Water Technologies Company.
  - i. Zurn Industries, LLC.
2. Standard: ASSE 1070.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded or compression inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 105 deg F.
9. Valve Finish: Rough bronze.

## 2.5 WATER-HAMMER ARRESTERS

### A. Water-Hammer Arresters (WHA):

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1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

## 2.6 TRAP-SEAL PRIMER DEVICE

### A. Supply-Type, Trap-Seal Primer Device (TPV):

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. Precision Plumbing Products.
  - e. ProFlo; a Ferguson Enterprises, Inc. brand.
  - f. Sioux Chief Manufacturing Company, Inc.
  - g. WATTS; A Watts Water Technologies Company.
  - h. Zurn Industries, LLC.
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.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF PIPING SPECIALTIES

- A. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.
- B. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.
- C. Supply-Type, Trap-Seal Primer Device: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

### 3.2 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

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3.3 ADJUSTING

- A. Set field-adjustable flow set points of balancing valves.
- B. Set field-adjustable temperature set points of water-temperature limiting devices.

END OF SECTION

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SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Galvanized-steel pipe and fittings.
2. PVC pipe and fittings.
3. Specialty pipe fittings.

B. Related Requirements:

1. Section 221329 "Sanitary Sewerage Pumps" for effluent and sewage pumps.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Field quality-control reports.

1.4 FIELD CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:
1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
  2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

1.5 WARRANTY

- A. Listed manufacturers to provide labeling and warranty of their respective products.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10 ft. head of water.
  - 2. Waste, Force-Main Piping: 50 psig.

2.2 PIPING MATERIALS

- A. Piping materials to bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 GALVANIZED-STEEL PIPE AND FITTINGS

- A. Galvanized-Steel Pipe: ASTM A53/A53M, Type E, standard-weight cast iron. Include square-cut-grooved or threaded ends matching joining method.
- B. Cast-Iron Drainage Fittings: Galvanized; ASME B16.12, threaded.
- C. Steel Pipe Pressure Fittings:
  - 1. Steel Pipe Nipples: Galvanized; ASTM A733, made of ASTM A53/A53M or ASTM A106/A106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
  - 2. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
  - 3. Gray-Iron, Threaded Fittings: Galvanized; ASME B16.4, Class 125, standard pattern.

2.4 PVC PIPE AND FITTINGS

- A. Comply with NSF 14 for plastic piping components. Include "NSF-dwv" marking for plastic drain, waste, and vent piping and "NSF-sewer" marking for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D2665 drain, waste, and vent.
- C. PVC Socket Fittings: ASTM D2665, made in accordance with ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F656.
  - 1. Verify adhesive primer has a VOC content of 550 g/L or less.
- E. Solvent Cement: ASTM D2564.
  - 1. Verify solvent cement has a VOC content of 510 g/L or less.

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## 2.5 SPECIALTY PIPE FITTINGS

### A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Pressure Transition Couplings:
  - a. Standard: AWWA C219.
  - b. Description: Metal sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
  - c. Center-Sleeve Material: Manufacturer's standard.
  - d. Gasket Material: Natural or synthetic rubber.
  - e. Metal Component Finish: Corrosion-resistant coating or material.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
  1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
  2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

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1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
  2. Use long-turn, double Y-branch, and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
    - a. Straight tees, elbows, and crosses may be used on vent lines.
  3. Do not change direction of flow more than 90 degrees.
  4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
    - a. Reducing size of waste piping in direction of flow is prohibited.
- J. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
1. Horizontal Sanitary Waste Piping: Two percent downward in direction of flow.
  2. Vent Piping: One percent down toward vertical fixture vent or toward vent stack.
- K. Install steel piping in accordance with applicable plumbing code.
- L. Install aboveground PVC piping in accordance with ASTM D2665.
- M. Plumbing Specialties:
1. Install drains in sanitary waste gravity-flow piping.
    - a. Comply with requirements for drains specified in Section 221319.13 "Sanitary Drains."
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."
- 3.2 JOINT CONSTRUCTION
- A. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1.
1. Cut threads full and clean using sharp dies.
  2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

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- a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
  - c. Do not use pipe sections that have cracked or open welds.
- B. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
  - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Piping: Join in accordance with ASTM D2855 and ASTM D2665 appendixes.

### 3.3 INSTALLATION OF SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in ODs.
  - 2. In Aboveground Force Main Piping: Fitting-type transition couplings.
    - a. NPS 1-1/2 (DN 40) and Smaller: Fitting-type transition couplings.
    - b. NPS 2 (DN 50) and Larger: Pressure transition couplings.

### 3.4 INSTALLATION OF VALVES

- A. General valve installation requirements for general-duty valve installation are specified in Section 220523 "General-Duty Valves for Plumbing Piping."
- B. Shutoff Valves:
  - 1. Install shutoff valve on each sewage pump discharge.
  - 2. Install full-port ball valve for piping NPS 2 and smaller.
- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

### 3.5 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment".
  - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  - 2. Vertical Piping: MSS Type 8 or Type 42 clamps.
  - 3. Install individual, straight, horizontal piping runs:
    - a. 100 Ft. (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
- B. Install hangers for steel soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.



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- C. Install hangers for PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- E. Support vertical runs of steel soil piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- F. Support vertical runs of PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect waste and vent piping to the following:
  - 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
  - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
  - 5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties" and Section 221319.13 "Sanitary Drains."
  - 6. Equipment: Connect waste piping as indicated.
    - a. Provide shutoff valve if indicated and union for each connection.
    - b. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- C. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- D. Make connections in accordance with 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.

### 3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

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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 and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
    - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
    - a. Expose work that was covered or concealed before it was tested.
  - 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
    - a. Close openings in piping system and fill with water to point of overflow, but not less than 10 ft. head of water.
    - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    - c. Inspect joints for leaks.
  - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
    - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1 inch wg.
    - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    - d. Inspect plumbing fixture connections for gas and water leaks.
  - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 6. Prepare reports for tests and required corrective action.

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3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil, waste, and vent piping NPS 4 (DN 100) and smaller are to be the following:
  - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- C. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 (DN 40 and DN 50) are to be the following:
  - 1. Galvanized-steel pipe, pressure fittings, and threaded joints.

END OF SECTION

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SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Cleanouts.
  - 2. Miscellaneous sanitary drainage piping specialties.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

- A. Plastic Floor Cleanouts:
  - 1. Size: Same as connected branch.
  - 2. Body: PVC.
  - 3. Closure Plug: PVC.
  - 4. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

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2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

C. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

D. Install sleeve with each riser and stack passing through floors.

E. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 PIPING CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

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- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

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SECTION 221319.13 - SANITARY DRAINS

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. Floor drains.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

- A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

- A. Cast-Iron Floor Drains (FD-1):
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Jay R. Smith Mfg Co; a division of Morris Group International.

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- b. [Josam Company.](#)
  - c. [MIFAB, Inc.](#)
  - d. [WATTS; A Watts Water Technologies Company.](#)
  - e. [Zurn Industries, LLC.](#)
- 2. Standard: ASME A112.6.3.
  - 3. Pattern: Floor drain.
  - 4. Body Material: Gray iron.
  - 5. Outlet: Bottom.
  - 6. Top or Strainer Material: Nickel bronze.
  - 7. Top of Body and Strainer Finish: Nickel bronze.
  - 8. Top Shape: Square.
  - 9. Top Loading Classification: Light Duty.
  - 10. Funnel: Not required.
  - 11. Inlet Fitting: Trap-seal primer valve connection.
  - 12. Trap Pattern: Standard P-trap.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  - 1. Position floor drains for easy access and maintenance.
  - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
  - 3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

#### 3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

#### 3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION



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SECTION 221329 - SANITARY SEWERAGE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Packaged wastewater-pump units.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product indicated. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied. Include construction details, material descriptions, dimensions of individual components and profiles. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with manufacturer's written instructions for handling.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

2.2 PACKAGED WASTEWATER-PUMP UNITS

- A. Packaged, Submersible Wastewater-Pump Units:
  - 1. Description: Factory-assembled and -tested, automatic-operation, effluent-pump unit with basin.
  - 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. A.Y. McDonald Mfg. Co.
    - b. ABS; Cardo Flow Solutions.
    - c. Bell & Gossett; a Xylem brand.
    - d. GRUNDFOS CBS Inc.
    - e. Goulds Water Technology; a Xylem brand.
    - f. Liberty Pumps.
    - g. Little Giant; a brand of Franklin Electric Co., Inc.
    - h. Pentair Aurora; Pentair Pump Group.
    - i. ProFlo; a Ferguson Enterprises, Inc. brand.
    - j. Sta-Rite Industries, Inc.; Pentair Ltd.
    - k. Zoeller Company.
  - 3. Pump Type: Submersible, end-suction, single-stage, overhung-impeller, centrifugal pump as defined in HI 1.1-1.2 and HI 1.3.
  - 4. Pump Body and Impeller: Corrosion-resistant materials.
  - 5. Pump Seals: Mechanical.
  - 6. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection.
  - 7. Power Cord: Three-conductor, waterproof cable of length required, but not less than 72 inches and with grounding plug and cable-sealing assembly for connection at pump.
  - 8. Control: Float switch.
  - 9. Pump Discharge Piping: Factory or field fabricated, galvanized, ASTM A53/A53M, Schedule 40, steel pipe with ASME B16.4, Class 125, gray-iron threaded fittings.
  - 10. Basin: Watertight plastic with inlet pipe connection and gastight cover with vent and pump discharge connections.
- B. Capacities and Characteristics: As scheduled on Drawings.

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2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220500 "Common Work Results for Plumbing."
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of sanitary drainage and vent piping connections before sewage pump installation.

3.2 INSTALLATION

- A. Pump Installation Standards:
  - 1. Comply with HI 1.4 for installation of centrifugal pumps.
- B. Wiring Method: Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Perform each visual and mechanical inspection.
  - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Pumps and controls will be considered defective if they do not pass tests and inspections.

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3.5 ADJUSTING

- A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust control set points.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain pumps.

END OF SECTION

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SECTION 221414 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. PVC pipe and fittings.
2. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Field Quality-Control Reports: Inspection reports signed by authorities having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Provide materials bearing label, stamp, or other markings of specified testing agency.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  1. Notify Owner no fewer than two days in advance of proposed interruption of storm drainage service.
  2. Do not proceed with interruption of storm drainage service without Owner's written permission.

1.6 WARRANTY

- A. Listed manufacturers to provide labeling and warranty of their respective products

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation are to be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

2.2 PIPING MATERIALS

- A. Piping materials to bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 PVC PIPE AND FITTINGS

- A. PVC Pipe:

1. NSF Marking: Comply with NSF 14 for plastic piping components. Include marking with "NSF-dwv" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
2. Solid-Wall PVC Pipe: ASTM D2665 drain, waste, and vent.

- B. PVC Socket Fittings:

1. Standard: ASTM D2665, made in accordance with ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
2. NSF Marking: Comply with NSF 14 for plastic piping components. Include marking with "NSF-dwv" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

- C. Adhesive Primer: ASTM F656.

1. Verify adhesive primer has a VOC content of 550 g/L or less.

- D. Solvent Cement: ASTM D2564.

1. Verify solvent cement has a VOC content of 510 g/L or less.

2.4 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Shielded, Nonpressure Transition Couplings:

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- a. Standard: ASTM C1460.
- b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- c. End Connections: Same size as and compatible with pipes to be joined.

### PART 3 - EXECUTION

#### 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

#### 3.2 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
- B. Install piping as indicated unless deviations from layout are approved on coordination drawings.
- C. Install piping in concealed locations.
  - 1. Piping installed in equipment rooms, service areas, and where indicated may be exposed.
- 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.
- 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. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.
  - 1. Do not change direction of flow more than 90 degrees.
  - 2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
    - a. Reducing size of drainage piping in direction of flow is prohibited.
- L. Lay buried building piping beginning at low point of each system.
  - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.

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2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
  3. Maintain swab in piping and pull past each joint as completed.
- M. Install piping at the following minimum slopes unless otherwise indicated.
1. Building Storm Drain: 1/4 inch per foot downward in direction of flow for piping NPS 3 and smaller; 1/8 inch per foot downward in direction of flow for piping NPS 4 and larger.
  2. Horizontal Storm Drainage Piping: 1/4 inch per foot downward in direction of flow.
- N. Install aboveground PVC piping in accordance with ASTM D2665.
- O. Install underground PVC piping in accordance with ASTM D2321.
- P. Plumbing Specialties:
1. Install cleanouts in storm drainage gravity-flow piping in accessible locations.
    - a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
    - b. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."
  2. Install drains in storm drainage gravity-flow piping.
    - a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."
- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- R. Install sleeves for piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs.
1. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
- T. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors.
1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."
- 3.3 JOINT CONSTRUCTION
- A. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:



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1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join in accordance with ASTM D2855 and ASTM D2665 appendices.

### 3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
  1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
  3. Vertical Piping: MSS Type 8 or Type 42, clamps.
  4. Install individual, straight, horizontal piping runs:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
- B. Install hangers for PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- D. Support vertical PVC piping with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

### 3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.
  1. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
  2. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

### 3.6 IDENTIFICATION

- A. Identify exposed storm drainage piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

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### 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.
  - 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 storm drainage piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
    - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.
    - a. Expose work that was covered or concealed before it was tested.
  - 3. Test Procedure:
    - a. Test storm drainage piping on completion of roughing-in.
    - b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    - c. From 15 minutes before inspection starts until completion of inspection, water level must not drop.
    - d. 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.

### 3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.

### 3.9 PROTECTION

- A. Protect piping and drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

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- B. Place plugs in ends of uncompleted piping at end of day and when work stops.
- C. Repair damage to adjacent materials caused by storm drainage piping installation.

3.10 PIPING SCHEDULE

- A. Underground and Aboveground storm drainage piping NPS 6 and smaller is to be the following:
  - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION

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SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-purpose roof drains.
2. Cleanouts.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
1. General-purpose roof drains.
  2. Cleanouts.

1.3 QUALITY ASSURANCE

- A. Provide drainage piping specialties are to bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 GENERAL-PURPOSE ROOF DRAINS

A. Cast-Iron Roof Drains:

1. Cast-Iron, Medium-Sump, General-Purpose Roof Drains: (RD-1).
  - 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) Jay R. Smith Mfg Co; a division of Morris Group International.
    - 2) Josam Company.
    - 3) MIFAB, Inc.
    - 4) Wade; a subsidiary of McWane Inc.
    - 5) Zurn Industries, LLC.
  - b. Standard: ASME A112.6.4.
  - c. Body Material: Cast iron.

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- d. Dimension of Body: 8- to 12-inch diameter.
- e. Dome Material: Aluminum.
- f. Combination flashing ring and gravel stop.
- g. Outlet: Bottom.
- h. Outlet Type: No-hub.
- i. Options:
  - 1) Extension collars.
  - 2) Underdeck clamp.
  - 3) Sump Receiver plate.

## 2.2 CLEANOUTS

### A. Plastic Cleanouts:

- 1. Plastic Cleanouts: .
  - a. Size: Same as connected branch.
  - b. Body Material: PVC.
  - c. Closure Plug: PVC.
  - d. Type: Wall.
  - e. Cover Material and Finish: Steel with polished chrome finish.
  - f. Frame and Cover Shape: Round.
  - g. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install roof drains in accordance with roof membrane manufacturer's written installation instructions at low points of roof areas.
  - 1. Install flashing collar or flange of roof drain to maintain integrity of waterproof membranes where penetrated.
  - 2. Position roof drains for easy access and maintenance.
- B. Install cleanouts in aboveground piping and building drain piping in accordance with the following instructions unless otherwise indicated:
  - 1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
  - 3. Locate cleanouts at minimum intervals of 50 ft. for piping NPS 4 and smaller and 100 ft. for larger piping.
  - 4. Locate cleanouts at base of each vertical storm piping conductor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

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- D. Install test tees in vertical conductors and near floor.
- E. Install wall cleanouts in vertical conductors.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221414 "Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 CLEANING

- A. Clean piping specialties during installation and remove dirt and debris as work progresses.

3.4 PROTECTION

- A. Protect piping specialties during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day and when work stops.

END OF SECTION

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SECTION 224200 - COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial lavatories.
2. Commercial sinks.
3. Commercial water closets.
4. Flushometer valves.
5. Toilet seats.
6. Fixture carriers.

B. Related Requirements:

1. Section 221119 "Domestic Water Piping Specialties" for fixture/point-of-use temperature limiting devices.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product data. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

C. Shop Drawings:

1. Plans, elevations, sections, and mounting or attachment details.
2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 INFORMATIONAL SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Coordination Drawings: Counter cutout templates for mounting of counter-mounted sinks.

1.4 CLOSEOUT SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Operation and maintenance data.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Lavatory faucets and sink faucets, intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 COMMERCIAL LAVATORIES

A. Lavatories, Wall Mounted:

1. Lavatories, Wall Mounted - Vitreous China, Rectangular with Ledge Back (L-1):

- 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) American Standard.
  - 2) Briggs Plumbing Products, Inc.
  - 3) Gerber Plumbing Fixtures LLC.
  - 4) Kohler Co.
  - 5) Mansfield Plumbing Products LLC.
  - 6) ProFlo; a Ferguson Enterprises, Inc. brand.
  - 7) Sloan Valve Company.
  - 8) TOTO USA, INC.
- b. Fixture:
  - 1) Standard: ASME A112.19.2/CSA B45.1.
  - 2) Type: For wall hanging.
  - 3) Nominal Size: Rectangular, 20 by 18 inches.
  - 4) Faucet-Hole Punching: One hole.
  - 5) Faucet-Hole Location: Top.
  - 6) Color: White.
  - 7) Mounting Material: Chair carrier.
- c. Faucet: L-1.
- d. Support: Lavatory carrier, floor affixed with steel uprights, concealed arm.
- e. Lavatory Mounting Height: Accessible in accordance with ICC A117.1.
- f. Protective Shielding Guards: Required.

B. Lavatory Faucets, Automatically Operated (L-1):



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1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. American Standard.
  - b. Bradley Corporation.
  - c. Chicago Faucets; Geberit Group.
  - d. Delta Faucet Company.
  - e. Elkay.
  - f. Kohler Co.
  - g. Moen Incorporated.
  - h. Sloan Valve Company.
  - i. Speakman Company.
  - j. T&S Brass and Bronze Works, Inc.
  - k. TOTO USA, INC.
  - l. Zurn Industries, LLC.
2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
3. Operation Type: Battery powered electronic sensor operated, mixing. Provide ASSE 1070 protection either integral with faucet by manufacturer, or with ASSE 1070 temperature limiting device installed on hot water connection to faucet. For temperature limiting device, refer to Section 221119 "Domestic Water Piping Specialties."
4. 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.
5. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
6. Body Type: Single hole.
7. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
8. Finish: Polished chrome plate.
9. Maximum Flow Rate: 0.5 gpm.
10. Mounting Type: Deck, concealed.
11. Spout: Rigid, gooseneck type.
12. Spout Outlet: Laminar flow.

C. Lavatory Supply Fittings:

1. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.
2. Standard: ASME A112.18.1/CSA B125.1.
3. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless steel wall flange.
4. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
5. Operation: Loose key.
6. Risers:
  - a. ASME A112.18.6/CSA B125.6, braided or corrugated stainless steel, flexible hose riser.

D. Lavatory Waste Fittings:

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1. Standard: ASME A112.18.2/CSA B125.2.
2. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.
3. Trap:
  - a. Size: NPS 1-1/2 by NPS 1-1/4.
  - b. Material:
    - 1) Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.

## 2.3 COMMERCIAL SINKS

### A. Kitchen/Utility Sinks:

1. Kitchen/Utility Sinks, Drop-In Counter Mounted - Stainless Steel (S-2):
  - 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) Advance Tabco.
    - 2) Amerisink Inc.
    - 3) Eagle Group.
    - 4) Elkay.
    - 5) Just Manufacturing.
  - b. Source Limitations: Obtain sinks from single source from single manufacturer.
  - c. Fixture:
    - 1) Standard: ASME A112.19.3/CSA B45.4.
    - 2) Type: Stainless steel, self-rimming, sound-deadened unit with ledge back.
    - 3) Number of Compartments: One.
    - 4) Overall Dimensions: 19-inch by 19-inch, 6-1/2-inches deep.
    - 5) Material: 18 gauge, Type 304 stainless steel.
    - 6) Compartment:
      - a) Dimensions: 16-inch by 13-1/2-inch, 6-1/2-inches deep.
      - b) Drain: Grid with NPS 1-1/2 tailpiece.
      - c) Drain Location: Centered and near back of compartment.
      - d) Depth: Accessible in accordance with ICC A117.1.
  - d. Faucet(s): S-1/2.
    - 1) Number Required: One.
    - 2) Mounting: On ledge.
  - e. Mounting: Drop-in type, on counter with sealant.
2. Kitchen/Utility Sinks, Undermount Counter Mounted - Stainless Steel (S-1):

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- 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) Advance Tabco.
    - 2) Amerisink Inc.
    - 3) Eagle Group.
    - 4) Elkay.
    - 5) Just Manufacturing.
  - b. Source Limitations: Obtain sinks from single source from single manufacturer.
  - c. Fixture:
    - 1) Standard: ASME A112.19.3/CSA B45.4.
    - 2) Type: Stainless steel, undermount, sound-deadened unit with ledge back.
    - 3) Number of Compartments: One.
    - 4) Overall Dimensions: 18-1/2 inch by 18-1/2 inch, 5-3/8-inches deep.
    - 5) Material: 18 gauge, Type 304 stainless steel.
    - 6) Compartment:
      - a) Dimensions: 16-inch by 16-inch, 5-3/8-inches deep.
      - b) Drain: Grid with NPS 2 tailpiece.
      - c) Drain Location: Centered and near back of compartment.
      - d) Depth: Accessible in accordance with ICC A117.1.
  - d. Faucet(s): S-1/2.
    - 1) Number Required: One.
    - 2) Mounting: On countertop.
  - e. Mounting: Undermount type, on counter underside with sealant.
3. Supply Fittings:
- a. Standard: ASME A112.18.1/CSA B125.1.
  - b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.
    - 1) Operation: Loose key.
    - 2) Risers: NPS 1/2, ASME A112.18.6/CSA B125.6, braided or corrugated stainless steel flexible hose.
4. Waste Fittings:
- a. Standard: ASME A112.18.2/CSA B125.2.
  - b. Trap(s) Size: NPS 2.
  - c. Trap(s) Material:
    - 1) Chrome-plated, two-piece, cast-brass trap and swivel elbow with 17-gauge brass tube to wall; and chrome-plated brass or steel wall flange.

B. Sink Faucets, Manually Operated:

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1. Sink Faucets, Manually Operated (S-1/2): Single control, mixing.
  - 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) American Standard.
    - 2) Chicago Faucets; Geberit Group.
    - 3) Elkay.
    - 4) Gerber Plumbing Fixtures LLC.
    - 5) Kohler Co.
    - 6) Speakman Company.
    - 7) T&S Brass and Bronze Works, Inc.
    - 8) Zurn Industries, LLC.
  - b. Source Limitations: Obtain sink faucets from single source from single manufacturer.
  - c. Standards:
    - 1) ASME A112.18.1/CSA B125.1.
    - 2) NSF 61.
    - 3) NSF 372.
  - d. Description: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
  - e. Body Type: Single hole.
  - f. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
  - g. Finish: Polished chrome plate.
  - h. Maximum Flow Rate: 1.5 gpm.
  - i. Mounting Type: Deck, exposed.
  - j. Valve Handle(s): Lever.
  - k. Spout Type: Swivel, gooseneck.
  - l. Spout Outlet: Laminar flow.

## 2.4 COMMERCIAL WATER CLOSETS

### A. Water Closets, Wall Mounted:

1. Water Closets, Wall Mounted - Top Spud (WC-1):
  - 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) American Standard.
    - 2) Briggs Plumbing Products, Inc.
    - 3) Gerber Plumbing Fixtures LLC.
    - 4) Kohler Co.
    - 5) Mansfield Plumbing Products LLC.
    - 6) Sloan Valve Company.
    - 7) TOTO USA, INC.

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- 8) Zurn Industries, LLC.
- b. Source Limitations: Obtain water closets from single source from single manufacturer.
- c. Standard: ASME A112.19.2/CSA B45.1.
- d. Bowl:
  - 1) Material: Vitreous china.
  - 2) Type: Siphon jet.
  - 3) Style: Flushometer valve.
  - 4) Mounting Height: Accessible in accordance with ICC A117.1.
  - 5) Rim Contour: Elongated.
  - 6) Water Consumption: Dual flush 1.1 gal./1.6 gal. per flush.
  - 7) Spud Size and Location: NPS 1-1/2; top.
  - 8) Color: White.
- e. Flushometer Valve: WC-1.
- f. Toilet Seat: WC-1.
- g. Support: Water-closet carrier, floor affixed.

## 2.5 FLUSHOMETER VALVES

### A. Flushometer Valves, Manually Operated:

- 1. Flushometer Valves, Manually Operated - Diaphragm, Lever Handle (WC-1):
  - 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 Modern Technologies Corporation - AMTC.
    - 2) American Standard.
    - 3) Delany Products.
    - 4) I-Con Systems, Inc.
    - 5) Sloan Valve Company.
    - 6) Zurn Industries, LLC.
  - b. Source Limitations: Obtain flushometer valve from single source from single manufacturer.
  - c. Standard: ASSE 1037/ASME 112.1037/CSA B125.37.
  - d. Minimum Pressure Rating: 125 psig.
  - e. Features: Include integral check stop and backflow-prevention device.
  - f. Material: Brass body with corrosion-resistant components.
  - g. Style: Exposed.
  - h. Flushometer-Valve Finish: Chrome-plated.
  - i. Handle Finish: Antimicrobial.
  - j. Consumption: Dual flush 1.1 gal./1.6 gal. per flush.

## 2.6 TOILET SEATS

### A. Toilet Seats (WC-1):

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1. Source Limitations: Obtain toilet seat from single source from single manufacturer.
2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Heavy duty).
5. Shape: Elongated rim, open front.
6. Hinge: Check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

## 2.7 FIXTURE CARRIERS

### A. Fixture Carriers - Lavatory (L-1):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. WATTS; A Watts Water Technologies Company.
  - e. Wade; a subsidiary of McWane Inc.
  - f. Zurn Industries, LLC.
2. Source Limitations: Obtain lavatory carriers from single source from single manufacturer.
3. Standards:
  - a. ASME A112.6.1M.
  - b. ASME A112.6.2.

### B. Fixture Carriers - Water Closet (WC-1):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. MIFAB, Inc.
  - c. WATTS; A Watts Water Technologies Company.
  - d. Wade; a subsidiary of McWane Inc.
  - e. Zurn Industries, LLC.
  - f. Josam Company.
2. Source Limitations: Obtain water closet carriers from single source from single manufacturer.
3. Standard: ASME A112.6.1M.
4. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings, gaskets, and feet; bolts and hardware matching fixture.

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PART 3 - EXECUTION

3.1 INSTALLATION OF COMMERCIAL PLUMBING FIXTURES

A. Lavatory Installation:

1. Install lavatories level and plumb in accordance with roughing-in drawings.
2. Install supports, affixed to building substrate, for wall-mounted lavatories.
3. Install accessible, wall-mounted lavatories at mounting height in accordance with ICC A117.1.
4. Install water-supply piping with stop on each supply to each lavatory faucet. Install stops in locations that are accessible for ease of operation.
5. Install trap and waste piping on each drain outlet of each lavatory to be connected to sanitary drainage system.
6. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
7. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
8. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories.

B. Sink Installation:

1. Install sinks level and plumb in accordance with roughing-in drawings.
2. Install accessible, wall-mounted sinks at mounting height in accordance with ICC A117.1.
3. Install water-supply piping with stop on each supply to each sink faucet.
  - a. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General Duty Valves for Plumbing Piping."
  - b. Install stops/valves in locations that are accessible for ease of operation.
4. Install trap and waste piping on each drain outlet of each sink to be connected to sanitary drainage system.
5. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
6. Seal joints between sinks, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

C. Water Closet Installation:

1. Install water closets level and plumb in accordance with roughing-in drawings.
2. Install accessible, wall-mounted water closets at mounting height in accordance with ICC A117.1.
3. Use carrier supports with waste-fitting assembly and seal.

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4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals, and affix to building substrate.
5. Measure support height installation from finished floor, not structural floor.
6. Install flushometer-valve, water-supply fitting on each supply to each water closet.
7. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
8. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
9. Install actuators in locations easily reachable for people with disabilities.
10. Install new batteries in battery-powered, electronic-sensor mechanisms.
11. Install toilet seats on water closets.
12. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Install deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
13. Seal joints between water closets, walls, and floors using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to water-closet color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

### 3.2 INSTALLATION OF PIPING CONNECTIONS

- A. Connect plumbing fixtures with water supplies and soil, waste, and vent piping. Use size fittings required to match plumbing fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil, waste, and vent piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Install protective-shielding pipe covers and enclosures on exposed supplies and waste piping of accessible plumbing fixtures.
- E. Where installing piping adjacent to water closets and urinals, allow space for service and maintenance.

### 3.3 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damages finishes. Replace any fixtures unable to be repaired to the satisfaction of the Architect and Owner.
- B. Clean plumbing fixtures and associated faucets, valves, flushometer valves, and fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and associated faucets, valves, flushometer valves, and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION



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SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Motors.
2. Packless expansion joints.
3. Sleeves without waterstop.
4. Silicone sealants.

1.2 DEFINITIONS

- A. Existing Piping To Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
  - a. Include construction details, material descriptions, and dimensions of individual components, and finishes.

PART 2 - PRODUCTS

2.1 MOTORS

A. Motor Requirements, General:

1. Content includes motors for use on alternating-current power systems of up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
2. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
3. Comply with NEMA MG 1 unless otherwise indicated.

B. Motor Characteristics:

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1. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 ft. above sea level.
2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Single-Phase Motors:

1. Motors larger than 1/20 hp must be one of the following, to suit starting torque and requirements of specific motor application:
  - a. Permanent-split capacitor.
2. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
3. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
4. Motors 1/20 hp and Smaller: Shaded-pole type.
5. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device will automatically reset when motor temperature returns to normal range.

## 2.2 EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

A. Performance Requirements:

1. Compatibility: Provide products suitable for piping service fluids, materials, working pressures, and temperatures.
2. Capability: Provide products and installations that will accommodate maximum axial movement as indicated on Drawings.
3. Flexible-Hose Packless Expansion Joints: .
  - 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) ASC Engineered Solutions.
    - 2) Flex-Hose Co., Inc.
    - 3) Flex-Pression.
    - 4) Flex-Weld Inc., div of Kelco Industries.
    - 5) Flex-Weld; a division of Kelco.
    - 6) Flexicraft Industries.
    - 7) Kadant Unaflex, LLC.
    - 8) Metraflex Company (The).
    - 9) Proco Products, Inc.
    - 10) Unisource Manufacturing, Inc.
  - b. Source Limitations: Obtain flexible-hose packless expansion joints from single manufacturer.
  - c. 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.

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- d. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
- e. Expansion Joints for Copper Tubing NPS 2 (DN 50) and Smaller: Copper-alloy fittings with solder-joint end connections.
  - 1) Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.

## 2.3 SLEEVES

### A. Sleeves without Waterstop:

- 1. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.
- 2. Steel Sheet Sleeves: ASTM A653/A653M, 24 gauge minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.

### B. Silicone Sealants:

- 1. Silicone Sealant, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.
  - a. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.

## 2.4 ESCUTCHEONS

### A. Escutcheon Types:

- 1. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- 2. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF EXPANSION JOINTS - GENERAL

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.

### 3.2 INSTALLATION OF PIPE LOOPS AND SWING CONNECTIONS

- A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
- B. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

### 3.3 INSTALLATION OF SLEEVES - GENERAL

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

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- B. Install sleeves for pipes passing through interior partitions.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.
- C. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

### 3.4 INSTALLATION OF ESCUTCHEONS

- A. Install escutcheons for exposed piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

### 3.5 FIELD QUALITY CONTROL

- A. Escutcheons:
  - 1. Using new materials, replace broken and damaged escutcheons and floor plates.

### 3.6 SLEEVES APPLICATION

- A. Use sleeves for the following piping-penetration applications:
  - 1. Interior Walls and Partitions:
    - a. Sleeves without waterstops.

### 3.7 ESCUTCHEONS APPLICATION

- A. Escutcheons for New Piping and Relocated Existing Piping:
  - 1. Insulated Piping:
    - a. One piece, cast brass with polished, chrome-plated finish.
    - b. One piece, stamped steel with polished, chrome-plated finish.

END OF SECTION

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SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ball valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. PTFE: Polytetrafluoroethylene.

1.3 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

1. Include material descriptions and dimensions of individual components.
2. Include operating characteristics and furnished accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads and solder ends.
3. Set ball valves open to minimize exposure of functional surfaces.

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.

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PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of valve from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.22 for wrought copper and copper-alloy solder-joint connections.
3. ASME B16.34 for flanged- and threaded-end connections.
4. ASME B31.9 for building services piping valves.

- B. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are unacceptable.

- C. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

- D. Valve Sizes: Same as upstream piping unless otherwise indicated.

E. Valve Actuator Type:

1. Hand Lever: For quarter-turn ball valves smaller than NPS 4.

F. Valves in Insulated Piping:

1. Provide 2-inch extended neck stems.
2. Provide extended operating handles with nonthermal-conductive covering material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Provide memory stops that are fully adjustable after insulation is applied.

2.3 BALL VALVES

- A. Ball Valves, Threaded or Soldered Ends - Bronze, Two Piece with Full Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Appolo Valves, a part of Aalberts Integrated Piping Systems.
  - b. Crane Fluid Systems; Crane Co.
  - c. Hammond Valve.
  - d. Jenkins Valves; a Crane Co. brand.
  - e. Milwaukee Valve Company.

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- f. NIBCO INC.
  - g. Stockham; a Crane Co. brand.
  - h. WATTS; A Watts Water Technologies Company.
  - i. Zurn Industries, LLC.
- 2. Standard: MSS SP-110.
  - 3. SWP Rating: 150 psig.
  - 4. CWP Rating: 600 psig.
  - 5. Body Design: Two piece.
  - 6. Body Material: Bronze.
  - 7. Ends: Threaded or soldered.
  - 8. Seats: PTFE.
  - 9. Stem: Bronze.
  - 10. Ball: Chrome-plated brass.
  - 11. Port: Full.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Do not attempt to repair defective valves; replace with new valves. Remove defective valves from site.

#### 3.2 INSTALLATION OF VALVES

- A. Install valves with unions at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Provide support of piping adjacent to valves such that no force is imposed upon valves.
- C. Locate valves for easy access and where not blocked by equipment, other piping, or building components.
- D. For valves in horizontal piping, install valves with stem at or above center of pipe.
- E. Install valves in position that does not project into aisles or block access to other equipment.
- F. Install valves in position to allow full stem and manual operator movement.

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- G. Verify that joints of each valve have been properly installed and sealed to ensure that there is no leakage or damage.
- H. Valve Tags: Comply with requirements for valve tags and schedules in Section 230553 "Identification for HVAC Piping and Equipment."
- I. Adhere to manufacturer's written installation instructions. When soldering or brazing valves, do not heat valves above maximum permitted temperature. Do not use solder with melting point temperature above valve of manufacturer's written recommended maximum.

### 3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### 3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- B. Select valves with the following end connections:
  - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules.

### 3.5 HEATING-WATER BALL VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
  - 1. Ball valves, threaded or soldered ends - bronze, two piece with full port and bronze or brass trim; threaded or soldered ends.

END OF SECTION



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SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe hangers and supports - metal.
2. Strut support systems - metal, rod type.
3. Thermal-hanger shield inserts.
4. Fastener systems.

B. Related Requirements:

1. Section 233113 "Metal Ducts" for duct hangers and supports.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS - METAL

A. Pipe Hangers and Supports - Carbon Steel:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Hanger Rods: Continuous-thread rod, nuts, and washers made of carbon steel.

2.2 STRUT SUPPORT SYSTEMS - METAL, ROD TYPE

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. ABB, Electrification Business.
2. Anvil; an ASC Engineered Solution.
3. Atkore Unistrut.
4. CADDY; brand of nVent Electrical plc.
5. Carpenter & Paterson, Inc.

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6. Cooper B-line; brand of Eaton, Electrical Sector.
  7. Empire Industries, Inc.
  8. Flex-Strut Inc.
  9. G-Strut.
  10. Gripple Inc.
- B. Description: Factory-fabricated pipe-support assembly made of steel channels, vertical metal support rods, accessories, fittings, and other components for supporting multiple parallel pipes.
- C. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
- D. Struts: Continuous slotted carbon-steel channel with inturned lips.
- E. Strut Width: Selected for applicable load criteria.
- F. Strut Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
- G. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.
- H. Metallic Coating: Pregalvanized G90 or electroplated zinc.

### 2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Hot and Cold Piping: ASTM C552, Type II cellular glass with 100 psi or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125 psi minimum compressive strength and vapor barrier.
- B. For Clamped Systems: Insert and shield are to cover entire circumference of pipe.
- C. For Clevis or Band Hangers: Insert and shield are to cover bottom 180 degrees of pipe.
- D. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

### 2.4 FASTENER SYSTEMS

- A. Fastener System - Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities required for supported loads and building materials where used.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Hilti, Inc.
    - b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - c. MKT Fastening, LLC.

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- B. Fastener System - Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities required for supported loads and building materials where used.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Cooper B-line; brand of Eaton, Electrical Sector.
    - b. Empire Industries, Inc.
    - c. Hilti, Inc.
    - d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - e. MKT Fastening, LLC.
  - 2. Indoor Applications: Zinc-plated steel.

### PART 3 - EXECUTION

#### 3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static loads within specified loading limits. Minimum static design load used for strength determination is to include weight of supported components plus 200 lb.

#### 3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. Install hangers and supports to allow controlled thermal movement of piping systems, and to facilitate action of expansion loops.
- B. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping.
- C. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- D. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- E. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

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2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - a. Thermal-hanger shield inserts may be used as an option. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on hot and cold piping. Shields are to span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches long and 0.048 inch thick.
- F. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- G. Strut System Installation: Metal. Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.
- H. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- I. Fastener System Installation:
  1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick after concrete is placed and cured. Use installers that are licensed by powder-actuated tool manufacturer.
  2. Install mechanical-expansion anchors after concrete is placed and completely cured.
  3. Install fasteners in accordance with manufacturer's written instructions.
- J. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

### 3.3 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.

### 3.4 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use carbon-steel pipe hangers and supports and metal framing systems and attachments for general service applications.

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- E. Use thermal-hanger shield inserts for insulated piping and tubing.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
  - 2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
- G. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  - 2. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  - 3. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  - 4. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
- H. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  - 2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- I. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

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SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
- C. Valve Schedules: Provide for each piping system. Include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick.
2. Letter and Background Color: As indicated for specific application under Part 3.
3. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

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- B. Letter and Background Color: As indicated for specific application under Part 3.
- C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include:
  - 1. Flow-Direction Arrows: Include flow-direction arrows on distribution piping. Arrows may be either integral with label or applied separately.
  - 2. Lettering Size: At least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.

## 2.3 VALVE TAGS

- A. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
  - 1. Tag Material: Brass, 0.04-inch minimum thickness, with predrilled or stamped holes for attachment hardware.
  - 2. Fasteners: Brass link chain or beaded chain.
- B. Letter and Background Color: As indicated for specific application under Part 3.
- C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
  - 1. Include valve-tag schedule in operation and maintenance data.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

### 3.2 INSTALLATION, GENERAL 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.

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- D. Locate identifying devices so that they are readily visible from the point of normal approach.

### 3.3 INSTALLATION OF EQUIPMENT LABELS

- A. Permanently fasten labels on each item of mechanical equipment.
- B. Label Colors:
  - 1. White letters on black background.
- C. Locate equipment labels where accessible and visible.

### 3.4 INSTALLATION OF PIPE LABELS

- A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.
- 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. Within 3 ft. of each valve and control device.
  - 2. At access doors, manholes, and similar access points that permit view of concealed piping.
  - 3. Within 3 ft. of equipment items and other points of origination and termination.
  - 4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping, ductwork, and equipment.
- C. Do not apply plastic pipe labels or plastic tapes directly to bare pipes conveying fluids at temperatures of 125 deg F or higher. Where these pipes are to remain uninsulated, use a short section of insulation or use stenciled labels.
- D. Flow-Direction Arrows: Use arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- E. Pipe-Label Color Schedule:
  - 1. Heating Water Piping: White letters on an ANSI Z535.1 safety-green background.

### 3.5 INSTALLATION OF VALVE TAGS

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule in the operating and maintenance manual.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below.
  - 1. Valve-Tag Size and Shape: 1-1/2 inches, round.
  - 2. Valve-Tag Colors:



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- a. For each piping system, use the same lettering and background coloring system on valve tags as used for the Pipe Label Schedule text and background.

END OF SECTION

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SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Testing, Adjusting, and Balancing of Air Systems:
  - a. Variable-air-volume systems.
2. Testing, Adjusting, and Balancing of Hydronic Piping Systems:
  - a. Variable-flow hydronic systems.
3. Testing, adjusting, and balancing of equipment.
4. Testing, adjusting, and balancing of existing HVAC systems and equipment.
5. HVAC-control system verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: Submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- C. Contract Documents Examination Report: Submit the Contract Documents review report, as specified in Part 3.

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- D. Strategies and Procedures Plan: Submit TAB strategies and step-by-step procedures, as specified in "Preparation" Article.
- E. Certified TAB reports.
- F. Sample report forms.
- G. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.
  - 2. Serial number.
  - 3. Application.
  - 4. Dates of use.
  - 5. Dates of calibration.

#### 1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications, Certified by AABC:
  - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
  - 2. TAB Technician: Employee of the TAB specialist and certified by AABC.
- B. TAB Specialists Qualifications, Certified by NEBB or TABB:
  - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
  - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB.
- C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."
- E. Code and AHJ Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

#### 1.6 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

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PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- E. Examine test reports specified in individual system and equipment Sections.
- F. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- G. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- H. Examine existing and provided strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and existing and permanent strainer screens are clean.
- I. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.
- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine existing system pumps to ensure absence of entrained air in the suction piping.
- L. Examine operating safety interlocks and controls on HVAC equipment.
- M. Examine control dampers for proper installation for their intended function of isolating, throttling, diverting, or mixing air flows.
- N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
  - 1. Equipment and systems to be tested.

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2. Strategies and step-by-step procedures for balancing the systems.
  3. Instrumentation to be used.
  4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
1. Airside:
    - a. Duct systems are complete with terminals installed.
    - b. Volume and fire dampers are open and functional.
    - c. Clean filters are installed.
    - d. Existing fans are operating, free of vibration, and rotating in correct direction.
    - e. Existing and provided automatic temperature-control systems are operational.
    - f. Ceilings are installed.
    - g. Windows and doors are installed.
    - h. Suitable access to balancing devices and equipment is provided.
  2. Hydronics:
    - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
    - b. Piping is complete with terminals installed.
    - c. Systems are flushed, filled, and air purged.
    - d. Strainers are pulled and cleaned.
    - e. Provided control valves are functioning in accordance with the sequence of operation.
    - f. Shutoff and balance valves have been verified to be 100 percent open.
    - g. Existing pumps are started and proper rotation is verified.
    - h. Suitable access to balancing devices and equipment is provided.

### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system in accordance with the procedures contained in AABC's "National Standards for Total System Balance," ASHRAE 111, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.
  1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
  2. Where holes for probes are required in piping or hydronic equipment, install pressure and temperature test plugs to seal systems.
  3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish in accordance with Section 230713 "Duct Insulation" and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

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- D. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.4 TESTING, ADJUSTING, AND BALANCING OF HVAC EQUIPMENT

- A. Test, adjust, and balance HVAC equipment indicated on Drawings, including, but not limited to, the following:
  - 1. Pumps.
  - 2. Fans.
  - 3. Terminal units.
  - 4. Air-handling units.
  - 5. Coils.

### 3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' Record drawings duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Check dampers for proper position to achieve desired airflow path.
- G. Check for airflow blockages.

### 3.6 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 two-thirds 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 set point 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. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.

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- 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.

### 3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and equipment flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' Record drawings piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
  - 1. Check expansion tank for proper setting.
  - 2. Check highest vent for adequate pressure.
  - 3. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
  - 4. Check that air has been purged from the system.
- D. Measure and record upstream and downstream pressure of each piece of equipment.
- E. Check settings and operation of automatic temperature-control valves. Record final settings.

### 3.8 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals.
- B. For systems with no flow diversity:
  - 1. Adjust pumps to deliver total design flow.
    - a. Measure total water flow.
      - 1) Position valves for full flow through coils.
      - 2) Measure flow by main flow meter, if installed.
      - 3) If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.
    - b. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
  - 2. Adjust flow-measuring devices installed at terminals for each space to design water flows.

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- a. Measure flow at terminals.
- b. Adjust each terminal to design flow.
- c. Re-measure each terminal after it is adjusted.
- d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.

### 3.9 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

### 3.10 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each hydronic coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.

### 3.11 HVAC CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify existing and provided HVAC control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of valve and damper actuators.
6. Verify that controlled devices are properly installed and connected to correct controller.
7. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
8. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

### 3.12 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.



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1. Measure and record the operating speed, airflow, and static pressure of each fan and equipment with fan(s).
  2. Measure and record flows, temperatures, and pressures of each piece of equipment in each hydronic system. Compare the values to design or nameplate information, where information is available.
  3. Measure motor voltage and amperage. Compare the values to motor nameplate information.
  4. Check the condition of filters.
  5. Check the condition of coils.
  6. Check the operation of the drain pan and condensate-drain trap.
  7. Check bearings and other lubricated parts for proper lubrication.
  8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
  2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
  3. If calculations increase or decrease the airflow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
  4. Balance each air outlet.

### 3.13 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent or minus 5 percent.
  2. Air Outlets and Inlets: Plus 10 percent or minus 5 percent. If design value is less than 100 cfm, within 10 cfm.
  3. Heating-Water Flow Rate: Plus or minus 5 percent. If design value is less than 10 gpm, within 10 percent.

### 3.14 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report, signed and sealed by the certified testing and balancing engineer.
  2. Include a list of instruments used for procedures, along with proof of calibration.
  3. Certify validity and accuracy of field data.
- B. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.

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2. Name and address of the TAB specialist.
  3. Project name.
  4. Project location.
  5. Architect's name and address.
  6. Engineer's name and address.
  7. Contractor's name and address.
  8. Report date.
  9. Signature of TAB supervisor who certifies the report.
  10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  11. Summary of contents, including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  12. Nomenclature sheets for each item of equipment.
  13. Data for terminal units, including manufacturer's name, type, size, and fittings.
  14. Notes to explain why certain final data in the body of reports vary from indicated values.
  15. Test conditions for fans performance forms, including the following:
    - a. Settings for outdoor-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Fan drive settings, including settings and percentage of maximum pitch diameter.
    - d. Variable-frequency controller settings for variable-air-volume systems.
    - e. Settings for pressure controller(s).
    - f. Other system operating conditions that affect performance.
  16. Test conditions for pump performance forms, including the following:
    - a. Variable-frequency controller settings for variable-flow hydronic systems.
    - b. Settings for pressure controller(s).
    - c. Other system operating conditions that affect performance.
- C. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Water flow rates.
  2. Duct, outlet, and inlet sizes.
  3. Pipe and valve sizes and locations.
  4. Terminal units.
  5. Position of balancing devices.
- D. Air-Handling-Unit Test Reports: For air-handling units, include the following:
1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Unit arrangement and class.

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- f. Discharge arrangement.
    - g. Number, type, and size of filters.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and speed.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan speed.
    - d. Inlet and discharge static pressure in inches wg.
- E. Fan Test Reports: For supply, return, and exhaust fans, include the following:
  - 1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and speed.
    - c. Volts, phase, and hertz.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm.
- F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
  - 1. Report Data:
    - a. System fan and air-handling-unit number.
    - b. Location and zone.
    - c. Duct size in inches.
    - d. Duct area in sq. ft..
    - e. Indicated airflow rate in cfm.
    - f. Indicated velocity in fpm.
    - g. Actual airflow rate in cfm.
    - h. Actual average velocity in fpm.
- G. Air-Terminal-Device Reports:

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1. Unit Data:
    - a. System and air-handling unit identification.
    - b. Location and zone.
    - c. Apparatus used for test.
    - d. Area served.
    - e. Make.
    - f. Number from system diagram.
    - g. Type and model number.
    - h. Size.
  2. Test Data (Indicated and Actual Values):
    - a. Airflow rate in cfm.
    - b. Air velocity in fpm.
    - c. Preliminary airflow rate as needed in cfm.
    - d. Preliminary velocity as needed in fpm.
    - e. Final airflow rate in cfm.
    - f. Final velocity in fpm.
- H. System-Coil Reports: For reheat coils of terminal units, include the following:
1. Unit Data:
    - a. System and air-handling-unit identification.
    - b. Location and zone.
    - c. Room or riser served.
    - d. Coil make and size.
  2. Test Data (Indicated and Actual Values):
    - a. Airflow rate in cfm.
    - b. Water pressure drop in feet of head or psig.
- I. Pump Test Reports:
1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Service.
    - d. Make and size.
    - e. Model number.
    - f. Water flow rate in gpm.
    - g. Water pressure differential in feet of head or psig.
    - h. Pump speed.
    - i. Motor horsepower and rpm.
  2. Test Data (Indicated and Actual Values):
    - a. Final discharge pressure in feet of head or psig.
    - b. Final suction pressure in feet of head or psig.
    - c. Final total pressure in feet of head or psig.

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d. Final water flow rate in gpm.

J. Instrument Calibration Reports:

1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

END OF SECTION

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SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:

1. Indoor, concealed supply and return air.

- B. Related Requirements:

1. Section 230719 "HVAC Piping Insulation."

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product indicated. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers are to be marked with the manufacturer's name, appropriate ASTM standard designation, type and grade, and maximum use temperature.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General" and "Indoor Duct and Plenum Insulation Schedule" articles for where insulating materials are to be applied.

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- B. Products do not contain asbestos, lead, mercury, or mercury compounds.
- C. Glass-Fiber Blanket: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 450 deg F in accordance with ASTM C411. Comply with ASTM C553, Type II, and ASTM C1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. CertainTeed; SAINT-GOBAIN.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.
    - d. Manson Insulation Inc.
    - e. Owens Corning.

## 2.3 ADHESIVES

- A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Glass-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. Verify fiberglass adhesive has a VOC content of 80 g/L or less when calculated in accordance with 40 CFR 59, Subpart D (EPA Method 24).
- C. FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
  - 1. Verify adhesive has a VOC content of 80 g/L or less when calculated in accordance with 40 CFR 59, Subpart D (EPA Method 24).

## 2.4 MASTICS AND COATINGS

- A. Materials are compatible with insulation materials, jackets, and substrates.
  - 1. VOC Content: 300 g/L or less.
- B. Vapor-Retarder Mastic, Water Based, Interior Use: Suitable for indoor use on below ambient services.
  - 1. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
  - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 3. Comply with MIL-PRF-19565C, Type II, for permeance requirements.
  - 4. Color: White.

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## 2.5 SEALANTS

### A. FSK Flashing Sealants:

1. Materials are compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. Verify sealant has a VOC content of 420 g/L or less.

## 2.6 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. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

## 2.7 TAPES

### A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Width: 3 inches.

## 2.8 SECUREMENTS

### A. Insulation Pins and Hangers:

1. 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. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - b. Spindle: Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
  - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
2. 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. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - b. Spindle: Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
  - c. Adhesive-backed base with a peel-off protective cover.



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3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel or aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
  - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

#### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Keep insulation materials dry during application and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.
- F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- G. Install insulation with least number of joints practical.
- H. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

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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.
- I. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
  - J. Install insulation with factory-applied jackets as follows:
    1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
    2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
    3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
      - a. For below ambient services, apply vapor-barrier mastic over staples.
    4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
    5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
  - K. Cut insulation in a manner to avoid compressing insulation.
  - L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
  - M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

### 3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
  1. Comply with requirements in Section 078413 "Penetration Firestopping."
- C. Insulation Installation at Floor Penetrations:
  1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
  2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

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### 3.5 INSTALLATION OF GLASS-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts: Secure with adhesive and insulation pins.
- B. Comply with manufacturer's written installation instructions.
  - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
  - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  - 3. Install insulation 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, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not overcompress insulation during installation.
    - e. Impale insulation over pins and attach speed washers.
    - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
  - 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
  - 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  - 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

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3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Ducts Requiring Insulation:

1. Indoor, concealed supply and return air.

B. Items Not Insulated:

1. Factory-insulated flexible ducts.
2. Exhaust ducts.

3.7 INDOOR DUCT INSULATION SCHEDULE

A. Concealed, round, supply- and return-air duct insulation is the following:

1. Glass-Fiber Blanket: 1-1/2 inches thick and 0.75 lb/cu. ft. nominal density.

END OF SECTION

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SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulation for HVAC piping systems.
- B. Related Requirements:
  - 1. Section 230713 "Duct Insulation" for duct insulation.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied, if any).

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation system materials are to be delivered to the Project site in unopened containers. The packaging is to include name of manufacturer, fabricator, type, description, and size.

1.4 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

1.5 SCHEDULING

- A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84 by a testing agency acceptable to authority having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

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1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

## 2.2 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General" and "Indoor Piping Insulation Schedule" articles for where insulating materials are applied.
- B. Products do not contain asbestos, lead, mercury, or mercury compounds.
- C. Glass-Fiber, Preformed Pipe: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 850 deg F in accordance with ASTM C411. Comply with ASTM C547.
  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. Johns Manville; a Berkshire Hathaway company.
    - b. Knauf Insulation.
    - c. Manson Insulation Inc.
    - d. Owens Corning.
  2. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ-SSL.
  3. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
  4. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

## 2.3 ADHESIVES

- A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Glass-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  1. Adhesive: As recommended by mineral fiber manufacturer and with a VOC content of 80 g/L or less.
- C. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.
  1. Verify adhesives have a VOC content of 50 g/L or less.

## 2.4 MASTICS AND COATINGS

- A. Materials are compatible with insulation materials, jackets, and substrates.
  1. Mastics: As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.
- B. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

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1. Water-Vapor Permeance: ASTM E96/E96M, greater than 1.0 perm at manufacturer's recommended dry film thickness.
2. Service Temperature Range: 0 to plus 180 deg F.
3. Color: White.

## 2.5 SEALANTS

- A. Materials are as recommended by the insulation manufacturer and are compatible with insulation materials, jackets, and substrates.
- B. ASJ Flashing Sealants:
  1. Fire- and water-resistant, flexible, elastomeric sealant.
  2. Service Temperature Range: Minus 40 to plus 250 deg F.
  3. Color: White.
  4. Verify sealant has a VOC content of 420 g/L or less.

## 2.6 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-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

## 2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
  1. Width: 3 inches.

## 2.8 SECUREMENTS

- A. Staples: Outward-clinching insulation staples, nominal 3/4 inch wide, stainless steel or Monel.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.
- E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- F. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with the Contract Documents.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
  - 3. Install insert materials and 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.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.



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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.
  4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
- L. Cut insulation in a manner to avoid compressing insulation.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.
- O. 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.

### 3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
  2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.
- B. Insulation Installation on Fittings, Valves, Strainers, and Unions:
1. Install insulation over fittings, valves, strainers, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

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2. Insulate pipe elbows using prefabricated fitting insulation or mitered fittings made from same material and density as that of adjacent pipe insulation. Each piece is 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 prefabricated fitting insulation or sectional pipe insulation of same material and thickness as that 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 prefabricated fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 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 prefabricated fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 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 unions using a section of oversized preformed pipe insulation to fit. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
  7. For services not specified to receive a field-applied jacket, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

### 3.6 INSTALLATION OF GLASS-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  2. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
- B. Insulation Installation on Pipe Fittings and Elbows:
1. Install prefabricated sections of same material as that of 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.

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C. Insulation Installation on Valves and Pipe Specialties:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated sections are not available, install fabricated sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3.7 PIPING INSULATION SCHEDULE, GENERAL

- A. Insulation conductivity and thickness per pipe size comply with schedules in this Section or with requirements of authorities having jurisdiction, whichever is more stringent.
- B. 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.

3.8 INDOOR PIPING INSULATION SCHEDULE

- A. Heating-Hot-Water Supply and Return, 200 Deg F and Below:
  1. NPS 12 and Smaller: Insulation is the following:
    - a. Glass-Fiber, Preformed Pipe, Type I: 1 inch thick.

END OF SECTION

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SECTION 230923 - DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Direct digital control (DDC) system for HVAC.
- B. The direct digital control system shall consist of a high-speed, peer-to-peer network of DDC controllers, a control system server, and a web-based operator interface. DDC system is for monitoring and controlling various HVAC systems. The control system shall be seamlessly integrated with the State of Maine Building Control Center (BCC) which provides 24 hours a day, 7 days a week, 365 days a year monitoring of state facilities. The HVAC controls shall be an extension of the existing Honeywell Enterprise Building Integrator (EBI) with host server hardware located in Augusta Maine. The Building Automation System (BAS) shall enable monitoring and control of mechanical systems installed under the scope of this project through to the BCC. Integration of HVAC system, panels, associated devices, front-end programming, and graphics is proprietary to Honeywell International Inc.
- C. Engage Owner's control system integrator, Honeywell EBI, to provide the following services:
  - 1. Enterprise system expansion and development of graphics, logs, reports, trends, and other operational capabilities of enterprise system for I/O being added to DDC control system for use by enterprise system operators.
  - 2. Limited assistance during commissioning to extent of DDC system integration with existing enterprise system.
  - 3. Prepare on-site demonstration mockup of integration of DDC system to be installed with existing system before installing DDC system.
  - 4. Integration of modified DDC assets into existing State of Maine FORGE program that uses analytics to report abnormalities within the HVAC systems.
  - 5. Integration of modified DDC assets into existing State of Maine Command & Control Suite model that provides monitoring, optimization, and automation of essential functions for HVAC and other systems.
- D. Related Requirements:
  - 1. Section 260553 "Identification for Electrical Systems" for identification requirements for electrical power and communications components

1.2 DEFINITIONS

- A. Algorithm: A logical procedure for solving a recurrent mathematical problem. A prescribed set of well-defined rules or processes for solving a problem in a finite number of steps.
- B. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.
- C. BACnet Specific Definitions:

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1. BACnet: Building Automation Control Network Protocol, ASHRAE 135. A communications protocol allowing devices to communicate data and services over a network.
  2. BACnet Interoperability Building Blocks (BIBBs): BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBs are combined to build the BACnet functional requirements for a device.
  3. BACnet/IP: Defines and allows using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number.
  4. BACnet Testing Laboratories (BTL): Organization responsible for testing products for compliance with ASHRAE 135, operated under direction of BACnet International.
- D. BCC: Existing State of Maine Building Control Center.
- E. Binary: Two-state signal where a high signal level represents "ON" or "OPEN" condition and a low signal level represents "OFF" or "CLOSED" condition. "Digital" is sometimes used interchangeably with "Binary" to indicate a two-state signal.
- F. Controller: Generic term for any standalone, microprocessor-based, digital controller residing on a network, used for local or global control. Three types of controllers are indicated: network controllers, programmable application controllers, and application-specific controllers.
- G. Control System Integrator: An entity that assists in expansion of existing enterprise system and support of additional operator interfaces to I/O being added to existing enterprise system.
- H. COV: Changes of value.
- I. DDC System Provider: Authorized representative of, and trained by, DDC system manufacturer and responsible for execution of DDC system Work indicated.
- J. Distributed Control: Processing of system data is decentralized and control decisions are made at subsystem level. System operational programs and information are provided to remote subsystems and status is reported back. On loss of communication, subsystems to be capable of operating in a standalone mode using the last best available data.
- K. EBI: Honeywell Enterprise Building Integrator.
- L. HLC: Heavy load conditions.
- M. I/O: System through which information is received and transmitted. I/O refers to analog input (AI), binary input (BI), analog output (AO) and binary output (BO). Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature. Binary signals convert electronic signals to digital pulses (values) and generally represent two-position operating and alarm status. "Digital," (DI) and (DO), is sometimes used interchangeably with "Binary," (BI) and (BO), respectively.
- N. LAN: Local area network.
- O. 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.
- P. Mobile Device: A data-enabled phone or tablet computer capable of connecting to a cellular data network and running a native control application or accessing a web interface.

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- Q. Modbus TCP/IP: An open protocol for exchange of process data.
- R. MS/TP: Master-slave/token-passing, ISO/IEC/IEEE 8802-3. Datalink protocol LAN option that uses twisted-pair wire for low-speed communication.
- S. MTBF: Mean time between failures.
- T. Network Controller: Digital controller, which supports a family of programmable application controllers and application-specific controllers, that communicates on peer-to-peer network for transmission of global data.
- U. Network Repeater: Device that receives data packet from one network and rebroadcasts it to another network. No routing information is added to protocol.
- V. Peer to Peer: Networking architecture that treats all network stations as equal partners.
- W. RAM: Random access memory.
- X. Server: Computer used to maintain system configuration, historical and programming database.
- Y. TCP/IP: Transport control protocol/Internet protocol.
- Z. UPS: Uninterruptible power supply.
- AA. USB: Universal Serial Bus.
- BB. User Datagram Protocol (UDP): This protocol assumes that the IP is used as the underlying protocol.
- CC. VAV: Variable air volume.
- DD. WLED: White light emitting diode.

### 1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
  - 1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
  - 3. Product description with complete technical data, performance curves, and product specification sheets.
  - 4. Installation, operation, and maintenance instructions including factors effecting performance.

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5. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.
    - a. DDC controllers.
    - b. Enclosures.
    - c. Electrical power devices.
    - d. Temperature instruments.
    - e. Control dampers and actuators.
    - f. Control valves and actuators.
  6. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
  7. Each submitted piece of product literature to clearly cross reference specification and drawings that submittal is to cover.
- C. Software Submittal:
1. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.
- D. Shop Drawings:
1. General Requirements:
    - a. Include cover drawing with Project name, location, Owner, Architect, Contractor, and issue date with each Shop Drawings submission.
    - b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.
  2. Plan Drawings indicating the following:
    - a. Screened backgrounds of walls, structural grid lines, HVAC equipment, ductwork, and piping.
    - b. Room names and numbers with coordinated placement to avoid interference with control products indicated.
    - c. Exact placement of products in rooms, ducts, and piping to reflect proposed installed condition.
    - d. Network communication cable and raceway routing.
    - e. Proposed routing of wiring, cabling, conduit, and tubing; coordinated with building services for review before installation.
  3. Schematic drawings for each controlled HVAC system indicating the following:
    - a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper and valve, if included in Project.
    - b. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
    - c. A graphic showing location of control I/O in proper relationship to HVAC system.
    - d. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.

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- e. Unique identification of each I/O that to be consistently used between different drawings showing same point.
  - f. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays, and interface to DDC controllers.
  - g. Narrative sequence of operation.
- 4. DDC system network riser diagram indicating the following:
  - a. Each device provided connected to existing network with unique identification for each.
  - b. Interconnection of each different network in DDC system.
  - c. For each network, indicate communication protocol, speed, and physical means of interconnecting network devices, such as copper cable type, or optical fiber cable type. Indicate raceway type and size for each.
- 5. DDC system electrical power riser diagram indicating the following:
  - a. Each point of connection to field power with requirements (volts/phase/hertz/amperes/connection type) listed for each.
  - b. Each control power supply including transformers with unique identification for each.
  - c. Each product requiring power with requirements (volts/phase/hertz/amperes/connection type) listed for each.
  - d. Power wiring type and size, race type, and size for each.
- 6. Monitoring and control signal diagrams indicating the following:
  - a. Control signal cable and wiring between controllers and I/O.
  - b. Point-to-point schematic wiring diagrams for each product.
- 7. Color graphics indicating the following:
  - a. Itemized list of color graphic displays to be provided.
  - b. For each display screen to be provided, a true color copy showing layout of pictures, graphics, and data displayed.
- E. System Description:
  - 1. Full description of DDC system architecture, network configuration, operator interfaces and peripherals, servers, controller types and applications, gateways, routers and other network devices, and power supplies.
  - 2. Complete listing and description of each report, log and trend for format and timing, and events that initiate generation.
  - 3. System and product operation under each potential failure condition including, but not limited to, the following:
    - a. Loss of power.
    - b. Loss of network communication signal.
    - c. Control damper and valve actuator failure.
  - 4. Description of testing plans and procedures.
  - 5. Description of Owner training.



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F. Delegated Design Submittals: For DDC system products and installation indicated as being delegated.

1. Schedule for control dampers and actuators.
  - a. Flow at Project design and minimum flow conditions.
  - b. Face velocity at Project design and minimum airflow conditions.
  - c. Pressure drop across damper at Project design and minimum airflow conditions.
  - d. AMCA 500-D damper installation arrangement used to calculate and schedule pressure drop, as applicable to installation.
  - e. Maximum close-off pressure.
  - f. Leakage airflow at maximum system pressure differential (fan close-off pressure).
  - g. Torque required at worst case condition for sizing actuator.
  - h. Actuator selection indicating torque provided.
  - i. Actuator signal to control damper (open, close, or modulate).
  - j. Actuator position on loss of power.
  - k. Actuator position on loss of control signal.
2. Schedule for control valves and actuators.
  - a. Flow at Project design and minimum flow conditions.
  - b. Pressure-differential drop across valve at Project design flow condition.
  - c. Maximum system pressure-differential drop (pump close-off pressure) across valve at Project minimum flow condition.
  - d. Design and minimum control valve coefficient with corresponding valve position.
  - e. Maximum close-off pressure.
  - f. Leakage flow at maximum system pressure differential.
  - g. Torque required at worst case condition for sizing actuator.
  - h. Actuator selection indicating torque provided.
  - i. Actuator signal to control valve (open, close or modulate).
  - j. Actuator position on loss of power.
  - k. Actuator position on loss of control signal.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Statements:
  1. Systems Provider's Qualification Data.
  2. Manufacturer's qualification data.
- C. Product Certificates:
  1. Data Communications Protocol Certificates:
    - a. Certifying that each proposed DDC system component complies with ASHRAE 135.
- D. Field Quality-Control Reports: For DDC system equipment and components.

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## 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For DDC system.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Project Record Drawings of as-built versions of submittal Shop Drawings provided in electronic PDF format.
    - b. Testing and commissioning reports and checklists of completed final versions of reports, checklists, and trend logs.
    - c. As-built versions of submittal Product Data.
    - d. Names, addresses, email addresses, and 24-hour telephone numbers of Installer and service representatives for DDC system and products.
    - e. Engineering, installation, and maintenance manuals that explain how to do the following:
      - 1) Design and install new points, panels, and other hardware.
      - 2) Perform preventive maintenance and calibration.
      - 3) Debug hardware problems.
      - 4) Repair or replace hardware.
    - f. Documentation of all programs created using custom programming language including set points, tuning parameters, and object database.
    - g. Backup copy of graphic files, programs, and databases on electronic media.
    - h. List of recommended spare parts with part numbers and suppliers.
    - i. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including sensors.
    - j. Licenses, guarantees, and warranty documents.
    - k. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
    - l. Owner training materials.

## 1.6 QUALITY ASSURANCE

- A. DDC System Provider Qualifications:
  - 1. Authorized representative of, and trained by, DDC system manufacturer.
  - 2. In-place facility located within 100 miles of Project.
  - 3. Demonstrate past experience with installation of DDC system products being installed for period within five consecutive years before time of bid.
  - 4. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
  - 5. Service and maintenance staff assigned to support Project during warranty period.
  - 6. Product parts inventory to support ongoing DDC system operation for a period of not less than five years after Substantial Completion.

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7. DDC system manufacturer's backing to take over execution of the Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace products that fail in materials or workmanship within specified warranty period.
  1. Adjust, repair, or replace failures at no additional cost or reduction in service to Owner.
  2. Include updates or upgrades to software and firmware if necessary to resolve deficiencies.
    - a. Install updates only after receiving Owner's written authorization.
  3. Perform warranty service during normal business hours and commence within 24 hours of Owner's warranty service request.
  4. Warranty Period: Two year(s) from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

- A. Manufacturers: Subject to compliance with requirements, provide products by the following for modifications to existing system:
  1. Honeywell International Inc.

### 2.2 DDC SYSTEM DESCRIPTION

- A. Microprocessor-based monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.
  1. DDC system consisting of peer-to-peer network of distributed DDC controllers, other network devices, operator interfaces, and software.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### 2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design, Qualified Professional: Engage a qualified professional to design DDC system to satisfy requirements indicated.
  1. System Performance Objectives:
    - a. DDC system manages HVAC systems.

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- b. DDC system operates HVAC systems to achieve optimum operating costs while using least possible energy and maintaining specified performance.
  - c. DDC system responds to power failures, HVAC equipment failures, and adverse and emergency conditions encountered through connected I/O points.
  - d. DDC system operates while unattended by an operator and through operator interaction.
  - e. DDC system records trends and transactions of events and produces report information such as performance, energy, occupancies, and equipment operation.
- B. Surface-Burning Characteristics: Products installed in ducts, equipment, and return-air paths complying with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 50 or less.
- C. DDC System Speed:
  - 1. Response Time of Connected I/O:
    - a. Update AI point values connected to DDC system at least every five seconds for use by DDC controllers. Points used globally to also comply with this requirement.
    - b. Update BI point values connected to DDC system at least every five seconds for use by DDC controllers. Points used globally to also comply with this requirement.
    - c. AO points connected to DDC system to begin to respond to controller output commands within two second(s). Global commands to also comply with this requirement.
    - d. BO point values connected to DDC system to respond to controller output commands within two second(s). Global commands to also comply with this requirement.
  - 2. Display of Connected I/O:
    - a. Update and display analog point COV connected to DDC system at least every 10 seconds for use by operator.
    - b. Update and display binary point COV connected to DDC system at least every 10 seconds for use by operator.
    - c. Update and display alarms of analog and digital points connected to DDC system within 45 seconds of activation or change of state.
    - d. Update graphic display refresh within eight seconds.
    - e. Point change of values and alarms displayed from workstation to workstation when multiple operators are viewing from multiple workstations to not exceed graphic refresh rate indicated.
- D. Input Point Values Displayed Accuracy: Meet following end-to-end overall system accuracy, including errors associated with meter, sensor, transmitter, lead wire or cable, and analog to digital conversion.
  - 1. Flow:
    - a. Air (Terminal Units): Within 10 percent of design flow rate.
  - 2. Gas:

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- a. Carbon Dioxide: Within 50 ppm.
  - 3. Temperature, Dry Bulb:
    - a. Air: Within 1 deg F.
    - b. Space: Within 1 deg F.
- E. Precision of I/O Reported Values: Values reported in database and displayed to have following precision:
  - 1. Flow:
    - a. Air: Nearest 1/10th of a cubic feet per minute through 100 cfm; nearest cubic feet per minute between 100 and 1000 cfm; nearest 10 cfm between 1000 and 10,000 cfm; nearest 100 cfm above 10,000 cfm.
  - 2. Gas:
    - a. Carbon Dioxide (ppm): Nearest ppm.
  - 3. Position, Dampers and Valves (Percentage Open): Nearest 1 percent.
  - 4. Temperature:
    - a. Air, Ducts and Equipment: Nearest 1/10th of a degree.
    - b. Space: Nearest 1/10th of a degree.
- F. Control Stability: Control variables indicated within the following limits:
  - 1. Flow:
    - a. Air, Ducts and Equipment, except Terminal Units: Within 5 percent of design flow rate.
    - b. Air, Terminal Units: Within 10 percent of design flow rate.
  - 2. Gas:
    - a. Carbon Dioxide: Within 50 ppm.
  - 3. Temperature, Dry Bulb:
    - a. Air: Within 2 deg F.
    - b. Space: Within 2 deg F.
- G. Environmental Conditions for Controllers:
  - 1. Products to operate without performance degradation under ambient environmental temperature, pressure, and humidity conditions encountered for installed location.
  - 2. Protect products with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. House products not available with integral enclosures complying with requirements indicated in protective secondary enclosures. Installed location dictates the following NEMA 250 enclosure requirements:
    - a. Indoors, Heated and Air-Conditioned: Type 1.

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H. Environmental Conditions for Instruments and Actuators:

1. Instruments and actuators to operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.
2. Protect instruments, actuators, and accessories with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. House instruments and actuators not available with integral enclosures complying with requirements indicated in protective secondary enclosures. Installed location is to dictate the following NEMA 250 enclosure requirements:
  - a. Indoors, Heated and Air-conditioned: Type 1.

I. Electric Power Quality:

1. Ground Fault: Protect products from ground fault by providing suitable grounding. Products to not fail due to ground fault condition.

J. Backup Power Source:

1. Serve DDC system products that control HVAC systems and equipment served by a backup power source also from a backup power source.

K. Continuity of Operation after Electric Power Interruption:

1. Equipment and associated factory-installed controls, field-installed controls, electrical equipment, and power supply connected to building normal and backup power systems are to automatically return equipment and associated controls to operating state occurring immediately before loss of normal power, without need for manual intervention by operator when power is restored either through backup power source or through normal power if restored before backup power is brought online.

## 2.4 SYSTEM ARCHITECTURE

A. Special Network Architecture Requirements:

1. Air-Handling Systems: For control applications of an air-handling system that consists of air-handling unit(s) and VAV terminal units, include a dedicated LAN of application-specific controllers serving VAV terminal units connected directly to controller that is controlling air-handling-system air-handling unit(s). Basically, create DDC system LAN that aligns with air-handling system being controlled.

## 2.5 DDC SYSTEM OPERATOR INTERFACES

- A. Existing to remain, remote State of Maine Building Control Center (BCC).

## 2.6 NETWORK COMMUNICATION PROTOCOL

- A. Use network communication protocol(s) that are open to Owner and available to other companies for use in making future modifications to DDC system.

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B. ASHRAE 135 Protocol:

1. Use ASHRAE 135 communication protocol as sole and native protocol used throughout entire DDC system.
2. DDC system to not require use of gateways except to integrate HVAC equipment and other building systems and equipment; not required to use ASHRAE 135 communication protocol.

2.7 SYSTEM SOFTWARE

A. Existing to remain.

- B. DDC system shall interface with an existing BCC building control center enterprise system to adhere to Owner standards already in-place and to achieve integration. Integration is limited to 3 State of Maine network connections.

2.8 DDC CONTROLLERS

- A. DDC system consisting of a combination of network controllers, programmable application controllers, and application-specific controllers to satisfy performance requirements indicated.

- B. DDC controllers are to use a multitasking, multiuser, real-time digital control microprocessor with a distributed network database and intelligence.

- C. Each DDC controller is capable of full and complete operation as a completely independent unit and as a part of DDC system wide distributed network.

D. Environment Requirements:

1. Controller hardware suitable for anticipated ambient conditions.
2. Controllers located in conditioned space rated for operation at 32 to 120 deg F.

E. Power and Noise Immunity:

1. Operate controller at 90 to 110 percent of nominal voltage rating and perform an orderly shutdown below 80 percent of nominal voltage.
2. Protect against electrical noise of 5 to 120 Hz and from keyed radios with up to 5 W of power located within 36 inches of enclosure.

- F. DDC Controller Spare I/O Point Capacity: Include spare I/O point capacity for each controller as follows:

1. Application-Specific Controllers:

- a. 10 percent of each AI, AO, BI, and BO point connected to controller.
  - 1) Option to provide universal I/O to meet spare requirements.

- G. Maintenance and Support: Include the following features to facilitate maintenance and support:

1. Mount microprocessor components on circuit cards for ease of removal and replacement.

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2. Means to quickly and easily disconnect controller from network.
3. Means to quickly and easily access connect to field test equipment.
4. Visual indication that controller electric power is on, of communication fault or trouble, and that controller is receiving and sending signals to network.

H. I/O Point Interface:

1. Connect hardwired I/O points to network, programmable application, and application-specific controllers.
2. Protect I/O points so shorting of point to itself, to another point, or to ground will not damage controller.
3. Protect I/O points from voltage up to 24 V of any duration so that contact will not damage controller.
4. AIs:
  - a. Include monitoring of low-voltage (0 to 10 V dc), current (4 to 20 mA) and resistance signals from thermistor and RTD sensors.
  - b. Compatible with, and field configurable to, sensor and transmitters installed.
  - c. Perform analog-to-digital (A-to-D) conversion with a minimum resolution of 8 bits or better to comply with accuracy requirements indicated.
  - d. Signal conditioning including transient rejection for each AI.
  - e. Capable of being individually calibrated for zero and span.
  - f. Incorporate common-mode noise rejection of at least 50 dB from 0 to 100 Hz for differential inputs, and normal-mode noise rejection of at least 20 dB at 60 Hz from a source impedance of 10000 ohms.
  - g. External conversion resistors are not permitted.
5. AOs:
  - a. Perform analog-to-digital (A-to-D) conversion with a minimum resolution of 8 bits or better to comply with accuracy requirements indicated.
  - b. Output signals range of 4 to 20 mA dc as required to include proper control of output device.
  - c. Capable of being individually calibrated for zero and span.
  - d. Drift is to be not greater than 0.4 percent of range per year.
  - e. External conversion resistors are not permitted.
6. BIs:
  - a. Accept contact closures and ignore transients of less than 5 ms duration.
  - b. Isolate and protect against an applied steady-state voltage of up to 180 V ac peak.
  - c. Include a wetting current of at least 12 mA to be compatible with commonly available control devices and protected against effects of contact bounce and noise.
  - d. Sense "dry contact" closure without external power (other than that provided by controller) being applied.
  - e. Pulse accumulation input points complying with all requirements of BIs and accept up to 10 pulses per second for pulse accumulation. Include buffer to totalize pulses. Pulse accumulator is to accept rates of at least 20 pulses per second. Reset the totalized value to zero on operator's command.
7. BOs:



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- a. Include relay contact closures or triac outputs for momentary and maintained operation of output devices.
  - 1) Relay contact closures to have a minimum duration of 0.1 second and at least 180 V of isolation.
  - 2) Include electromagnetic interference suppression on all output lines to limit transients to non-damaging levels.
  - 3) Minimum contact rating to be 1 A at 24 V ac.
  - 4) Triac outputs to have at least 180 V of isolation and minimum contact rating of 1 A at 24 V ac.
- b. Include BOs with two-state operation or a pulsed low-voltage signal for pulse-width modulation control.
- c. BOs to be selectable for either normally open or normally closed operation.
- d. Include tristate outputs (two coordinated BOs) for control of three-point, floating-type electronic actuators without feedback.

## 2.9 APPLICATION-SPECIFIC CONTROLLERS

- A. Description: Microprocessor-based controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment or system. Controllers are not fully user-programmable but are configurable and customizable for operation of equipment they are designed to control.
  - 1. Capable of standalone operation and continued control functions without being connected to network.
  - 2. Share data between networked controllers and other network devices.
- B. Communication: Application-specific controllers are to communicate with other application-specific controllers and devices on network, and to programmable application controllers and network controllers.
- C. Operator Interface: Equip controllers with a service communications port for connection to portable operator's workstation or mobile device.
- D. Serviceability:
  - 1. Equip controller with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
  - 2. Connect wiring and cable connections to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
  - 3. Use nonvolatile memory and maintain all BIOS and programming information in event of power loss.

## 2.10 CONTROLLER SOFTWARE

- A. General:
  - 1. Software applications are to reside and operate in controllers. Edit applications through existing operator workstation.

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2. Identify I/O points by up to 30-character point name and up to 16-character point descriptor. Use same names throughout, including at operator workstations.
  3. Execute control functions within controllers using DDC algorithms.
  4. Configure controllers to use stored default values to ensure fail-safe operation. Use default values when there is a failure of a connected input instrument or loss of communication of a global point value.
- B. Security:
1. Secure operator access using individual security passwords and user names.
  2. Passwords restrict operator to points, applications, and system functions as assigned by system manager.
  3. Record operator log-on and log-off attempts.
  4. Protect from unauthorized use by automatically logging off after last keystroke. Make the delay time operator-definable.
- C. System Coordination:
1. Include standard application for proper coordination of equipment.
  2. Include operator with a method of grouping together equipment based on function and location.
  3. Include groups that may be for use in scheduling and other applications.
- D. Binary Alarms:
1. Set each binary point to alarm based on operator-specified state.
  2. Include capability to automatically and manually disable alarming.
- E. Analog Alarms:
1. Provide each analog object with both high and low alarm limits.
  2. Include capability to automatically and manually disable alarming.
- F. Reporting: Reports and logs shall be provided via the existing Honeywell EBI system and shall include the following:
1. All I/O: With current status and values.
  2. Alarm: All current alarms, except those in alarm lockout.
  3. Disabled I/O: All I/O points that are disabled.
  4. Alarm Lockout I/O: All I/O points in alarm lockout, whether manual or automatic.
  5. Alarm Lockout I/O in Alarm: All I/O in alarm lockout that are currently in alarm.
  6. Logs:
    - a. Alarm history.
    - b. System messages.
    - c. System events.
    - d. Trends.
    - e. Communications
- G. Alarm Reporting:
1. Include ability for operators to determine action to be taken in event of an alarm.
  2. Route alarms to appropriate operator workstations based on time and other conditions.

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3. Include ability for alarms to start programs, print, be logged in event logs, generate custom messages, and display graphics.

H. Control Loops:

1. Support any of the following control loops, as applicable to control required:
  - a. Two-position (on/off, open/close, slow/fast) control.
  - b. Proportional control.
  - c. Proportional plus integral (PI) control.
  - d. Proportional plus integral plus derivative (PID) control.
    - 1) Include PID algorithms with direct or reverse action and anti-windup.
    - 2) Algorithm to calculate a time-varying analog value used to position an output or stage a series of outputs.
    - 3) Make controlled variable, set point, and PID gains operator-selectable.
  - e. Adaptive (automatic tuning).

2.11 ENCLOSURES

A. General:

1. House each controller and associated control accessories in enclosure. Enclosure is to serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies, and transformers.

2.12 RELAYS

A. General-Purpose Relays:

1. NRTL listed.
2. Heavy-duty, electromechanical type; rated for at least 10 A at 250 V ac and 60 Hz.
3. SPDT, DPDT, or three-pole double-throw, as required by control application.
4. Plug-in-style relay with 8-pin octal or multiblade plug for DPDT relays.
5. Construct contacts of silver, silver alloy, or gold.
6. Enclose relay in a polycarbonate dust-tight cover.
7. Include LED indication.
8. Equip relays with coil transient suppression to limit transients to non-damaging levels.
9. Plug each relay into industry-standard, 35 mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
10. Include relay socket with screw terminals. Mold into socket the coincident screw terminal numbers.

2.13 ELECTRICAL POWER DEVICES

A. Control Transformers:

1. Sizing Criteria: Size control transformers for total connected load, plus additional 25 percent of connected load for future spare capacity.

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2. Transformer Minimum Capacity: 100 VA.
3. Protection: Provide transformers with both primary and secondary fuses. Integral circuit breaker is acceptable in lieu of fuses.
4. Enclosure: House control transformers in NEMA 250 enclosures, type as indicated in "Performance Requirements" Article for application.

## 2.14 CONTROL WIRE AND CABLE

### A. Wire: Single conductor control wiring above 24 V.

1. Wire Size: Minimum 18 AWG.
2. Conductors: 7/24 soft annealed copper strand with 2- to 2.5-inch lay.
3. Conductor Insulation: 600 V, Type THWN or Type THHN, and 90 deg C in accordance with UL 83.
4. Conductor Insulation Colors: Black (hot), white (neutral), and green (ground).
5. Furnish on spools.

### B. Single, Twisted-Shielded, Instrumentation Cable above 24 V:

1. Wire Size: Minimum 18 AWG.
2. Conductors: Twisted, 7/24 soft annealed copper strand with a 2- to 2.5-inch lay.
3. Conductor Insulation: Type THHN/THWN or Type TFN rating.
4. Conductor Insulation Colors:
  - a. Twisted Pair: Black and white.
  - b. Twisted Triad: Black, red, and white.
5. Shielding: 100 percent type, 0.35/0.5-mil aluminum/Mylar tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
6. Outer Jacket Insulation: 600 V, 90 deg C rating, and Type TC cable.
7. Furnish on spools.

### C. Single, Twisted-Shielded, Instrumentation Cable 24 V and Less:

1. Wire Size: Minimum 18 AWG.
2. Conductors: Twisted, 7/24 soft annealed copper stranding with a 2- to 2.5-inch lay.
3. Conductor Insulation: Nominal 15-mil thickness, constructed from flame-retardant PVC.
4. Conductor Insulation Colors:
  - a. Twisted Pair: Black and white.
  - b. Twisted Triad: Black, red, and white.
5. Shielding: 100 percent type, 1.35-mil aluminum/polymer tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
6. Outer Jacket Insulation: 300 V, 105 deg C rating, and Type PLTC cable.
7. Furnish on spools.

### D. LAN and Communication Cable: Comply with DDC system manufacturer requirements for network being installed.

1. Comply with following requirements for balanced twisted pair cable described in Section 260523 "Control-Voltage Electrical Power Cables."

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- a. Plenum rated.
- b. Unique color that is different from other cables used on Project.

## 2.15 RACEWAYS

- A. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems" and Section 260533.16 "Boxes and Covers for Electrical Systems" for electrical power raceways and boxes.
- B. Comply with requirements in Section 270528 "Pathways for Communications Systems" for raceways for balanced twisted pair cables.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify compatibility with and suitability of substrates.
- B. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
- C. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.
- D. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 DDC SYSTEM INTERFACE WITH EXISTING SYSTEMS

- A. Interface with Existing Systems:
  - 1. Interface DDC systems with existing systems to achieve integration indicated.
  - 2. Monitoring and Control of DDC System by Existing Control System:
    - a. Satisfy DDC system performance requirements when monitoring and controlling DDC system by existing control system.
    - b. Operator of existing system to upload, download, monitor, trend, control, and program every I/O point in DDC system from existing control system using existing control system software and operator workstations.
    - c. Make interface so operator of existing system is not required to learn new software for remote monitoring and control from existing control system.

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- d. Make interface of DDC system into existing control system transparent to operators of existing control system and allow operators to program, monitor, and control DDC system from existing operator workstation connected to existing control system.
- 3. Integration of Existing Control System into DDC System:
  - a. Satisfy existing control system performance requirements when monitoring and controlling existing control system through DDC system.
  - b. Operator to upload, download, monitor, alarm, report, trend, control, and program every I/O point in existing system from DDC system using operator workstations and software provided. Combined systems to share one database.
  - c. Make interface of existing control system I/O points into DDC system transparent to operators. Make all operational capabilities identical regardless of whether I/O already exists, or I/O is being installed.

### 3.3 CONTROL DEVICES FOR INSTALLATION BY INSTALLERS

- A. Deliver the following to duct fabricator and Installer for installation in ductwork. Include installation instructions to Installer and supervise installation for compliance with requirements.
  - 1. Control dampers, which are specified in Section 230923.12 "Control Dampers."
- B. Deliver the following to HVAC piping installers for installation in piping. Include installation instructions to Installer and supervise installation for compliance with requirements.
  - 1. Control valves, which are specified in Section 230923.11 "Control Valves."

### 3.4 GENERAL INSTALLATION REQUIREMENTS

- A. Install products to satisfy more stringent of all requirements indicated.
- B. Install products level, plumb, parallel, and perpendicular with building construction.
- C. Support products, wiring, and raceways.
- D. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.
- E. Fabricate openings and install sleeves in ceilings, floors, roof, and walls required by installation of products. Before proceeding with drilling, punching, and cutting, check for concealed work to avoid damage. Patch, flash, grout, seal, and refinish openings to match adjacent condition.
- F. Firestop Penetrations Made in Fire-Rated Assemblies: Comply with requirements in Section 078413 "Penetration Firestopping."
- G. Seal penetrations made in acoustically rated assemblies. Comply with requirements in Section 079200 "Joint Sealants."
- H. Fastening Hardware:

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1. Wrenches, pliers, and other tools that damage surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening fasteners.
  2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
  3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.
- I. If product locations are not indicated, install products in locations that are accessible and that will permit service and maintenance from floor or ladders without removal of permanently installed furniture and equipment.

### 3.5 INSTALLATION OF CONTROLLERS

- A. Install controllers in enclosures to comply with indicated requirements.
- B. Connect controllers to field power supply.
- C. Install controllers with latest version of applicable software and configure to execute requirements indicated.
- D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.
- E. Application-Specific Controllers:
1. DDC system provider and DDC system manufacturer to determine quantity and location of application-specific controllers to satisfy requirements indicated.
  2. For controllers not mounted directly on equipment being controlled, install controllers in a protected location that is easily accessible by operators.

### 3.6 ELECTRIC POWER CONNECTIONS

- A. Connect electrical power to DDC system products requiring electrical power connections.
- B. Design of electrical power to products not indicated with electric power is delegated to DDC system provider and installing trade to provide a fully functioning DDC system. Work is to comply with NFPA 70 and other requirements indicated.
- C. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power conductors and cables.
- D. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems," Section 260533.16 "Boxes and Covers for Electrical Systems," and Section 260533.23 "Surface Raceways for Electrical Systems" for electrical power raceways and boxes.

### 3.7 INSTALLATION OF IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements in Section 260553 "Identification for Electrical Systems" for identification products and installation.

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- B. Install self-adhesive labels with unique identification on face for each of the following:
  - 1. DDC controller.
- C. Install unique identification for each control damper and valve actuator connected to DDC controller.

### 3.8 INSTALLATION OF NETWORKS

- A. Install balanced twisted pair or copper cable (as required by equipment) when connecting between the following:
  - 1. Network controllers and programmable application controllers.
  - 2. Programmable application controllers and application-specific controllers.
  - 3. Application-specific controllers.
- B. Install cable in continuous raceway.

### 3.9 NETWORK NAMING AND NUMBERING

- A. Coordinate with Owner and provide unique naming and addressing for networks and devices.
- B. ASHRAE 135 Networks:
  - 1. Device Object Identifier Property Number:
    - a. Assign unique device object identifier property numbers or device instances for each device network.
    - b. Provide for future modification of device instance number by device switches or operator interface.
    - c. LAN is to support up to 4,194,302 unique devices.
  - 2. Device Object Name Property Text:
    - a. Device object name property field to support 32 minimum printable characters.
    - b. Assign unique device "Object Name" property names with plain-English descriptive names for each device.
      - 1) Short Descriptor Building Code, Device type – Device – parameter.
      - 2) Example – BRH\_HEX\_3\_1/3\_VlvCtrl.
      - 3) Long Descriptor City, Street Address, Device Location, Device type – Device – parameter.
      - 4) Augusta, 90 Blossom Lane, Basement, Heat Exchanger 1/3 Valve, Open.
  - 3. Object Name Property Text for Other Than Device Objects:
    - a. Object name property field is to support 32 minimum printable characters.
    - b. Assign object name properties with plain-English names descriptive of application.
      - 1) Example 1: "Zone 1 Temperature."
      - 2) Example 2 "Fan Start and Stop."



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### 3.10 INSTALLATION OF CONTROL WIRE, CABLE, AND RACEWAY

- A. Comply with NECA 1.
- B. Wire and Cable Installation:
  - 1. Comply with installation requirements in Section 260523 "Control-Voltage Electrical Power Cables."
  - 2. Install cables in conduit in inaccessible locations such as above inaccessible ceiling (including wood ceiling) and within walls.
  - 3. Install cables with protective sheathing that is waterproof and capable of withstanding continuous temperatures of 90 deg C with no measurable effect on physical and electrical properties of cable.
    - a. Provide shielding to prevent interference and distortion from adjacent cables and equipment.
  - 4. Terminate wiring in a junction box.
    - a. Clamp cable over jacket in a junction box.
    - b. Individual conductors in the stripped section of cable is to be slack between the clamping point and terminal block.
  - 5. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.
  - 6. Install signal transmission components in accordance with IEEE C2, REA Form 511a, NFPA 70, and as indicated.
  - 7. Use shielded cable to transmitters.
  - 8. Use shielded cable to temperature sensors.
  - 9. Perform continuity and meager testing on wire and cable after installation.
- C. Conduit Installation:
  - 1. Comply with Section 260533.13 "Conduits for Electrical Systems," Section 260533.16 "Boxes and Covers for Electrical Systems," and Section 260533.23 "Surface Raceways for Electrical Systems" for control-voltage conductors.

### 3.11 FIELD QUALITY CONTROL

- A. Tests and Inspections: Perform the following tests and inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.12 DDC SYSTEM I/O CHECKOUT PROCEDURES

- A. Check installed products before continuity tests, leak tests, and calibration.
- B. Check instruments for proper location and accessibility.

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- C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
- D. Control Damper Checkout:
  - 1. Verify that control dampers are installed correctly for flow direction.
  - 2. Verify that proper blade alignment, either parallel or opposed, has been provided.
  - 3. Verify that damper frame attachment is properly secured and sealed.
  - 4. Verify that damper actuator and linkage attachment are secure.
  - 5. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
  - 6. Verify that damper blade travel is unobstructed.
- E. Control Valve Checkout:
  - 1. Verify that control valves are installed correctly for flow direction.
  - 2. Verify that valve body attachment is properly secured and sealed.
  - 3. Verify that valve actuator and linkage attachment are secure.
  - 4. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
  - 5. Verify that valve ball, disc, or plug travel is unobstructed.
  - 6. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace valve if leaks persist.
- F. Instrument Checkout:
  - 1. Verify that instrument is correctly installed for location, orientation, direction, and operating clearances.
  - 2. Verify that attachment is properly secured and sealed.
  - 3. Verify that conduit connections are properly secured and sealed.
  - 4. Verify that wiring is properly labeled with unique identification, correct type, and size and is securely attached to proper terminals.
  - 5. Inspect instrument tag against approved submittal.
  - 6. For temperature instruments, verify the following:
    - a. Sensing element type and proper material.
    - b. Length and insertion.

### 3.13 DDC SYSTEM I/O ADJUSTMENT, CALIBRATION, AND TESTING

- A. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
- B. Provide written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
- C. For each analog instrument, make three-point test of calibration for both linearity and accuracy.
- D. Equipment and procedures used for calibration to comply with instrument manufacturer's written instructions.
- E. Provide diagnostic and test equipment for calibration and adjustment.

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1. Use field testing and diagnostic instruments and equipment with an accuracy at least twice the instrument accuracy of instrument to be calibrated. For example, test and calibrate an installed instrument with accuracy of 1 percent using field testing and diagnostic instrument with accuracy of 0.5 percent or better.
- F. Calibrate each instrument in accordance with instruction manual supplied by instrument manufacturer.
- G. If after calibration the indicated performance cannot be achieved, replace out-of-tolerance instruments.
- H. Comply with field testing requirements and procedures indicated by ASHRAE's Guideline 11, "Field Testing of HVAC Controls Components," in the absence of specific requirements, and to supplement requirements indicated.
- I. Analog Signals:
  1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
  2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
  3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistant source.
- J. Digital Signals:
  1. Check digital signals using a jumper wire.
  2. Check digital signals using an ohmmeter to test for contact making or breaking.
- K. Control Dampers:
  1. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
  2. Check and document open and close cycle times for applications with cycle time less than 30 seconds.
  3. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.
- L. Control Valves:
  1. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
  2. Check and document open and close cycle times for applications with cycle time less than 30 seconds.
- M. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.
- N. Switches: Calibrate switches to make or break contact at set points indicated.
- O. Transmitters:
  1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
  2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistant source.

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3.14 DDC SYSTEM CONTROLLER CHECKOUT

- A. Verify power supply.
  - 1. Verify voltage, phase, and hertz.
  - 2. Verify that protection from power surges is installed and functioning.
  - 3. Verify that ground fault protection is installed.
- B. Verify that wire and cabling are properly secured to terminals and labeled with unique identification.
- C. Verify that spare I/O capacity is provided.

3.15 DDC CONTROLLER I/O CONTROL LOOP TESTS

- A. Testing:
  - 1. Test every I/O point connected to DDC controller to verify that safety and operating control set points are as indicated and as required to operate controlled system safely and at optimum performance.
  - 2. Test every I/O point throughout its full operating range.
  - 3. Test every control loop to verify that operation is stable and accurate.
  - 4. Adjust control loop proportional, integral, and derivative settings to achieve optimum performance while complying with performance requirements indicated. Document testing of each control loop's precision and stability via trend logs.
  - 5. Test and adjust every control loop for proper operation according to sequence of operation.
  - 6. Test software and hardware interlocks for proper operation. Correct deficiencies.
  - 7. Operate each analog point at the following:
    - a. Upper quarter of range.
    - b. Lower quarter of range.
    - c. At midpoint of range.
  - 8. Exercise each binary point.
  - 9. For every I/O point in DDC system, read and record each value at operator workstation, at DDC controller, and at field instrument simultaneously. Value displayed at operator workstation, at DDC controller, and at field instrument must match.
  - 10. Prepare and submit report documenting results for each I/O point in DDC system and include in each I/O point a description of corrective measures and adjustments made to achieve desired results.

3.16 DDC SYSTEM VALIDATION TESTS

- A. Perform validation tests before requesting final review of system. Before beginning testing, first submit Pretest Checklist and Test Plan.
- B. After review of Pretest Checklist and Test Plan, execute all tests and procedures indicated in plan.
- C. After testing is complete, submit completed Pretest Checklist.

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D. Pretest Checklist: Submit the following list with items checked off once verified:

1. Detailed explanation for any items that are not completed or verified.
2. Required mechanical installation work is successfully completed and HVAC equipment is working correctly.
3. Required DDC system components, wiring, and accessories are installed.
4. Control electric power circuits operate at proper voltage and are free from faults.
5. DDC system network communications function properly, including uploading and downloading programming changes.
6. Each controller's programming is backed up.
7. Equipment, products, wiring cable, and conduits are properly labeled.
8. All I/O points are programmed into controllers.
9. Testing, adjusting, and balancing work affecting controls is complete.
10. Dampers and actuators zero and span adjustments are set properly.
11. Each control damper and actuator goes to failed position on loss of power.
12. Valves and actuators zero and span adjustments are set properly.
13. Each control valve and actuator goes to failed position on loss of power.
14. Sensor and transmitter readings are accurate and calibrated.
15. Control loops are tuned for smooth and stable operation.
16. View trend data where applicable.
17. Each controller works properly in standalone mode.
18. Safety controls and devices function properly.
19. Record Drawings are completed.

E. Test Plan:

1. Prepare and submit validation Test Plan including test procedures for performance validation tests.
2. Address all specified functions of DDC system and sequences of operation in Test Plan.
3. Explain detailed actions and expected results to demonstrate compliance with requirements indicated.
4. Explain method for simulating necessary conditions of operation used to demonstrate performance.
5. Include Test Checklist to be used to check and initial that each test has been successfully completed.
6. Submit Test Plan documentation 10 business days before start of tests.

F. Validation Test:

1. Verify operating performance of each I/O point in DDC system.
  - a. Verify analog I/O points at operating value.
  - b. Make adjustments to out-of-tolerance I/O points.
    - 1) Identify I/O points for future reference.
    - 2) Simulate abnormal conditions to demonstrate proper function of safety devices.
    - 3) Replace instruments and controllers that cannot maintain performance indicated after adjustments.
2. Simulate conditions to demonstrate proper sequence of control.
3. Readjust settings to design values and observe ability of DDC system to establish desired conditions.

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4. 24 hours after initial validation test, do as follows:
  - a. Re-check I/O points that required corrections during initial test.
  - b. Identify I/O points that still require additional correction and make corrections necessary to achieve desired results.
5. Completely check out, calibrate, and test all connected hardware and software to ensure that DDC system performs according to requirements indicated.
6. After validation testing is complete, prepare and submit report indicating results of testing. For all I/O points that required correction, indicate how many validation re-tests it took to pass. Identify adjustments made for each test and indicate instruments that were replaced.

### 3.17 FINAL REVIEW

- A. Submit written request to Architect and/or Owner when DDC system is ready for final review. State the following:
  1. DDC system has been thoroughly inspected for compliance with Contract Documents and found to be in full compliance.
  2. DDC system has been calibrated, adjusted, and tested and found to comply with requirements of operational stability, accuracy, speed, and other performance requirements indicated.
  3. DDC system monitoring and control of HVAC systems results in operation according to sequences of operation indicated.
  4. DDC system is complete and ready for final review.
- B. Upon receipt of written request for final review, Architect and/or Owner to start review within reasonable period and upon completion issue field report(s) documenting observations and deficiencies.
- C. Take prompt action to remedy deficiencies indicated in reviewer's field report(s) and submit second written request after all deficiencies have been corrected. Repeat process until no deficiencies are reported.
- D. Prepare and submit closeout submittals when no deficiencies are reported.
- E. Part of DDC system final review to include demonstration to parties participating in final review.
  1. Provide staff familiar with DDC system installed to demonstrate operation of DDC system during final review.

### 3.18 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

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3.19 MAINTENANCE SERVICE

- A. Beginning at Substantial Completion, verify that maintenance service includes 12 months' full maintenance by DDC system manufacturer's authorized service representative. Include annual preventive maintenance, repair or replacement of worn or defective components, cleaning, calibration, and adjusting as required for proper operation. Use only manufacturer's authorized replacement parts and supplies.

END OF SECTION

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SECTION 230923.11 - CONTROL VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ball-style control valves.
2. Globe-style control valves.
3. Electric and electronic control valve actuators.

B. Related Requirements:

1. Section 230923 "Direct Digital Control (DDC) System for HVAC" control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.

1.2 DEFINITIONS

A. Cv: Valve coefficient.

B. DDC: Direct digital control.

C. PTFE: Polytetrafluoroethylene.

D. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

1.3 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

1. Ball-style control valves.
2. Globe-style control valves.
3. Electric and electronic control valve actuators.

C. Product Data Submittals: For each product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical



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- power requirements, and limitations of ambient operating environment, including temperature and humidity.
- 3. Product description with complete technical data, performance curves, and product specification sheets.
- 4. Installation, operation, and maintenance instructions, including factors affecting performance.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For control valves.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- C. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.
- D. Code Compliance: Comply with governing energy code.
- E. Ground Fault: Properly ground products to prevent failing due to ground fault conditions.
- F. Backup Power Source: Serve control valve actuators from a backup power source where associated with systems and equipment served by a backup power source.
- G. Selection Criteria:
  - 1. Control Valve Leakage: FCI 70-2, Class IV or less leakage, unless otherwise indicated.
  - 2. Control Valve Pattern: Straight-through.
  - 3. Control Valve Flow Characteristics, Unless Otherwise Indicated:
    - a. Modulating, Two-Way Pattern: Equal percentage.
  - 4. Fail-Safe Positions, Unless Otherwise Indicated:
    - a. Heating Hot Water: Open.
  - 5. Stable Operation: Select control valves and actuators for stable operation throughout full range of operation, from design Cv at design flow to minimum Cv.
  - 6. Control Valve Styles:

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a. Hydronic Systems:

- 1) Pipe Sizes NPS 2 (DN 50) and Smaller: Ball- or globe-style control valves.

H. Sizing Criteria: Unless otherwise indicated, select control valve size using the following:

1. Ball-Style Control Valves: Select valve size with design Cv at design flow between 65 and 75 degrees of valve full open position and minimum Cv between 15 and 25 percent of open position.
2. Globe-Style Control Valves: Select valve size to pass the design Cv at design flow with not more than 95 percent of stem travel.
3. Modulating Control Valves in Hydronic Systems:
  - a. Select modulating control valve sizes at terminal equipment for a design Cv based on a pressure drop of 3 psig at design flow.
4. Two-Position Valves: Select two-position control valves for full pipeline size.

## 2.2 BALL-STYLE CONTROL VALVES

A. Ball Valves with Characterized Disk and Threaded Ends, Two Way:

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. Belimo Aircontrols (USA), Inc.
  - b. Bray Commercial.
  - c. Honeywell Building Solutions; Honeywell International, Inc.
  - d. Johnson Controls, Inc.
  - e. Siemens Industry, Inc., Building Technologies Division.
2. Source Limitations: Obtain two-way ball valves, with characterized disk and threaded ends, from single manufacturer.
3. Performance:
  - a. Stem Action: Rotary, 0 to 90 degrees.
  - b. Flow Characteristic: Equal percentage.
  - c. Leakage: FCI 70-2, Class IV or less.
  - d. Hydronic Pressure:
    - 1) Rating for Sizes NPS 1-1/4 (DN 32) and Smaller: Nominal 600 psig.
    - 2) Close-off Pressure: 200 psig.
    - 3) Pressure Differential (Maximum): 50 psig.
  - e. Hydronic Process Temperature Range: 0 to 250 deg F.
4. Construction:
  - a. Size Range: NPS 1/2 to NPS 2.
  - b. Body: Cast bronze or forged brass.
  - c. End Connections: Female threaded (NPT) ends.

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- d. Ball: Chrome-plated brass or bronze or 300 series stainless steel.
- e. Ball Seats: Reinforced PTFE.
- f. Characterizing Disk: Tefzel or stainless steel.
- g. Stem and Stem Extension:
  - 1) Material to match ball.
  - 2) Blowout-proof design.
  - 3) For valves installed in insulated piping systems, provide stem extension extending beyond OD of insulation.
  - 4) Provide sleeve or other approved means to allow valve to be opened and closed without damaging the insulation.
- h. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if an equivalent cycle endurance can be demonstrated by testing.

## 2.3 GLOBE-STYLE CONTROL VALVES

### A. General Requirements:

- 1. Body Dimensions: Comply with ISA 75.08.01.
- 2. Field Service: Construct the valves to be serviceable from the top with replaceable seats and plugs.
- 3. Field-Interchangeable Trim:
  - a. Cage Guided Valves: Available with field-interchangeable trim for different valve flow characteristics, such as equal percentage, linear, and quick opening.
- 4. Nameplate: Corrosion-resistant, indicating the following:
  - a. Manufacturer's name, model number, and serial number.
  - b. Body and trim size.
  - c. Arrow indicating direction of flow.

### B. Globe Valves NPS 2 (DN 50) and Smaller, Two Way:

- 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. Belimo Aircontrols (USA), Inc.
  - b. IMI Hydronic Engineering Inc.
  - c. Johnson Controls, Inc.
  - d. Siemens Industry, Inc., Building Technologies Division.
- 2. Source Limitations: Obtain two-way globe valves, NPS 2 and smaller, from single manufacturer.
- 3. Performance:
  - a. Stem Action: Linear stem travel.
  - b. Flow Characteristic: Equal percentage.

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- c. Leakage: FCI 70-2, Class VI.
  - d. Hydronic Pressure:
    - 1) Rating: In accordance with ASME B16.15, Class 250.
    - 2) Close-off Pressure: Equal to pressure rating at maximum temperature.
    - 3) Pressure Differential (Maximum): 30 psig for sizes through NPS 2.
  - e. Ambient Operating Temperature: 35 to 150 deg F.
  - f. Process Temperature Range:
    - 1) Hydronic: 35 to 248 deg F.
4. Construction:
- a. Size Range: NPS 1/2 to NPS 2.
  - b. Body: Cast bronze or forged brass; ASME B16.15, Class 250.
  - c. End Connections: Female NPT threaded ends.
  - d. Bonnet: Bronze or brass, threaded.
  - e. Plug: Top guided.
  - f. Stainless Steel Trim:
    - 1) Packing: PTFE V-ring.
    - 2) Plug: Stainless steel.
    - 3) Seat: Stainless steel.
    - 4) Stem: Stainless steel.

## 2.4 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

- 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. Belimo Aircontrols (USA), Inc.
  - 2. Fischer; Emerson Electric Co., Automation Solutions.
  - 3. Honeywell International Inc.
  - 4. Keystone; Emerson Electric Co., Automation Solutions.
- B. Furnish control valves with factory-installed actuators from control valve manufacturer. Actuators manufactured by listed control valve manufacturers are acceptable subject to compliance with requirements.
- C. Actuators for Control Valves in Hydronic Systems: Select actuators to close off against system pump shutoff head.
- D. Type: Motor operated, with or without gears, electric and electronic.
- E. Voltage:
- 1. Voltage selection is delegated to professional designing control system.
  - 2. Actuator to deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
  - 3. Actuator to function properly within a range of 85 to 120 percent of nameplate voltage.

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- F. Construction:
  - 1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
  - 2. 100 up to 400 W: Ground steel gears, oil immersed; shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains are to be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
  - 3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.
- G. Local Field Adjustment: Make spring-return actuators easily switchable from fail-safe open to fail-safe closed in the field without replacement.
- H. Local Manual Override: Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.
- I. Two-Position Actuators: Single direction, spring-return or reversing type.
- J. Modulating Actuators:
  - 1. Capable of stopping at all points across full range, and starting in either direction from any point in range.
  - 2. Control Input Signal:
    - a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position, and other input drives actuator to close position. No signal of either input remains in last position.
    - b. Proportional: Actuator drives proportionally to input signal, modulates throughout its angle of rotation, and is suitable for 2 to 10 V dc and 4 to 20 mA signals.
- K. Position Feedback:
  - 1. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.
- L. Fail-Safe:
  - 1. Where indicated, provide actuator to fail to an end position.
  - 2. Internal spring-return mechanism to drive controlled device to an end position (open or close) on loss of power.
  - 3. Batteries, capacitors, and other nonmechanical forms of fail-safe operation are acceptable only where uniquely indicated.
- M. Integral Overload Protection:
  - 1. Provide against overload throughout the entire operating range in both directions.
  - 2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.
- N. Valve Attachment:
  - 1. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve stem without the need for connecting linkages.

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2. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.
  3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.
- O. Temperature and Humidity:
1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
  2. Humidity: Suitable for humidity range encountered by application; minimum operating range is to be from 5 to 95 percent relative humidity, noncondensing.
- P. Enclosure:
1. Suitable for ambient conditions encountered by application.
  2. NEMA 250, Type 2 for indoor applications.
- Q. Stroke Time:
1. Select operating stroke time to be compatible with equipment and system operation, and as follows:
    - a. Operate valve from fully closed to fully open position within 90 seconds.
    - b. Operate valve from fully open to fully closed position within 90 seconds.
    - c. Move valve to fail-safe position within 30 seconds.
- R. Sound: Where actuators are located in tenant-occupied rooms, comply with the following sound levels:
1. Spring Return: 60 dBA.
  2. Nonspring Return: 45 dBA.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for valves installed in piping to verify actual locations of piping connections before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 CONTROL VALVE APPLICATIONS

- A. Control Valves:

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1. Select from valves specified in "Control Valves" Article to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.

### 3.3 INSTALLATION, GENERAL

- A. Furnish and install products required to satisfy most stringent requirements indicated.
- B. Install products level, plumb, parallel, and perpendicular with building construction.
- C. Properly support control valves and actuators, tubing, piping, wiring, and conduits to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a seismic event, wind, or other forces common to the application.
- D. Seal penetrations made in fire-rated and acoustically rated assemblies.
- E. Fastening Hardware:
  1. Wrenches, pliers, and other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
  2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
  3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.
- F. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

### 3.4 CONTROL VALVES

- A. Install pipe reducers for control valves smaller than line size. Position reducers as close to control valve as possible but at distance to avoid interference and impact to performance. Install with manufacturer-recommended clearance.
- B. Install flanges or unions to allow drop-in and -out valve installation.
- C. Valve Orientation:
  1. Where possible, install ball and globe valves that are installed in horizontal piping, with stems upright and not more than 15 degrees off of vertical, not inverted.
  2. Install valves in a position to allow full stem movement.
- D. Clearance:
  1. Locate valves for easy access, and provide separate support of valves that cannot be handled by service personnel without hoisting mechanism.
  2. Install valves with at least 12 inches of clear space around valve and between valves and adjacent surfaces.
- E. Threaded Valves:

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1. Note internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
2. Align threads at point of assembly.
3. Apply thread compound to external pipe threads, except where dry seal threading is specified.
4. Assemble joint, wrench tight. Apply wrench on valve end as pipe is being threaded.

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Use same designation at each end for each piece of wire, cable, and tubing for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6 ELECTRICAL CONNECTIONS

- A. Install electrical power to field-mounted control devices requiring electrical power.
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Furnish and install raceways. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems."

3.7 CONTROL CONNECTIONS

- A. Install control signal wiring to field-mounted control devices.
- B. Connect control signal wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
- C. Furnish and install raceways. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems."

3.8 CLEANING

- A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed surfaces.

3.9 STARTUP

- A. Control Valve Checkout:
  1. Check installed products before continuity tests, leak tests, and calibration.
  2. Check valves for proper location and accessibility.



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3. Check valves for proper installation for direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
4. Verify that control valves are installed correctly for flow direction.
5. Verify that valve body attachment is properly secured and sealed.
6. Verify that valve actuator and linkage attachment are secure.
7. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
8. Verify that valve ball, disc, and plug travel are unobstructed.
9. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

3.10 ADJUSTMENT, CALIBRATION, AND TESTING

- A. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.
- B. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION

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SECTION 230923.12 - CONTROL DAMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular control dampers with flat blades.
2. Round control dampers.
3. Electric and electronic control-damper actuators.

B. Related Requirements:

1. Section 230923 "Direct Digital Control (DDC) System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.

1.2 DEFINITIONS

A. DDC: Direct digital control.

B. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

C. Thermal Efficiency Ratio (E): Comparison of a tested damper's thermal performance against a v-groove blade reference damper. A damper with the same thermal efficiency as the reference damper would have an E value of 0 percent, while a damper that is 4 times as efficient would have an E value of 200 percent.

1.3 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

1. Rectangular control dampers with flat blades.
2. Round control dampers.
3. Electric and electronic control-damper actuators.

C. Product Data Submittals: For each damper and actuator.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control

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- signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
- 3. Product description with complete technical data, performance curves, and product specification sheets.
- 4. Installation instructions, including factors affecting performance.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For control dampers.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE 62.1 Compliance: Applicable outdoor ventilation requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. Code Compliance: Comply with governing energy code.
- E. Ground Fault: Properly ground products to prevent failing due to ground fault conditions.
- F. Backup Power Source: Serve control-damper actuators from a backup power source where associated with systems and equipment served by a backup power source.
- G. Selection Criteria:
  - 1. Multi-Blade Damper Configuration: :
    - a. Two-Position Control: Opposed or parallel.
  - 2. Pressure and Temperature: Control dampers suitable for operating conditions encountered by the application:
  - 3. Fail-Safe Positions: :
    - a. Supply Air: Close.
    - b. Return Air: Close.
    - c. Exhaust Air: Close.
  - 4. Select dampers with smooth and stable operation throughout full range of operation over varying pressures and temperatures encountered.

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5. Sizing:

- a. Two-Position Dampers: Full size of duct or equipment connection unless otherwise indicated.

2.2 RECTANGULAR CONTROL DAMPERS WITH FLAT BLADES

A. General Requirements:

- 1. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.
  - a. Include multisection damper assemblies with intermediate reinforcing where required between individual sections being joined together. Construct reinforcing of same material (aluminum, galvanized steel, stainless steel) as damper frame.

B. Rectangular Control Dampers with Galvanized-Steel Flat Blades and Frames:

- 1. Source Limitations: Obtain rectangular control dampers, with galvanized-steel flat blades and frames, from single manufacturer.
- 2. AMCA Certification: Test, rate, and seal, in accordance with AMCA 511 for air performance and air leakage.
- 3. Performance:
  - a. Leakage:
    - 1) AMCA 511, Class II, at 1 in. wg Differential Static Pressure: Leakage not to exceed 5.4 cfm/sq. ft. against 1 in. wg differential static pressure when tested in accordance with AMCA 500D.
  - b. Pressure Drop: 0.1 in. wg at 1500 fpm across a 24-by-24-inch damper when tested in accordance with AMCA 500D, figure 5.3.
  - c. Pressure Rating: 3.0 in. wg.
  - d. Temperature: Minus 20 to plus 185 deg F.
  - e. Velocity: Up to 2000 fpm.
- 4. Construction:
  - a. Frame:
    - 1) Material: ASTM A653/A653M galvanized steel, minimum 0.06 inch thick.
    - 2) Arrangement: Hat-shaped channel with integral extended face flange(s) having mating face of minimum 1 inch for attachment to duct flanges.
  - b. Blades:
    - 1) Configuration: Parallel or opposed blade configuration as required by application.
    - 2) Material: ASTM A653/A653M galvanized steel, 0.06 inch thick.
    - 3) Shape: Single thickness with bends for reinforcing.
  - c. Seals:

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- 1) Blades: Replaceable; extruded silicone, vinyl, or damper manufacturer-offered equivalent, as required by performance requirements. Seals are to be mechanically attached in extruded blade slots.
- 2) Jambs: Stainless steel, compression type.

d. Axles:

- 1) Material: Plated steel.
- 2) Mechanically attached to blades.

e. Bearings:

- 1) Material: Molded nylon or synthetic, or stainless steel sleeve, as required by operating conditions, mounted in frame.
- 2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

- 1) Hardware: Plated steel.
- 2) Material: Plated steel.
- 3) Mounting: Concealed in frame.

g. Transitions with Sleeve:

- 1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connections.
- 2) Factory mount damper in a sleeve with a close transition to mate to field connection.
  - a) Sleeve length not less than 12 inches for dampers without jackshafts and not less than 16 inches for dampers with jackshafts.
- 3) Fabricate sleeve and transitions of galvanized steel.
- 4) Match end connections (flange or sleeve) to field connections.

## 2.3 ROUND CONTROL DAMPERS

### A. General Requirements:

1. Factory install actuator as integral part of damper assembly. Coordinate field requirements for actuators, such as type, fail-safe position, power supply, location, and mounting requirements with damper manufacturer.

### B. Round, Galvanized-Steel Control Dampers with Sleeve End Connections:

1. Source Limitations: Obtain round, galvanized-steel control dampers with sleeve end connections from single manufacturer.
2. Performance:
  - a. Leakage: Not to exceed 0.15 cfm/in. of perimeter blade at 4 in. wg differential static pressure when tested in accordance with AMCA 500D.

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- b. Pressure Drop: 0.05 in. wg at 1500 fpm across a 12-inch damper when tested in accordance with AMCA 500D, figure 5.3.
  - c. Pressure Rating: 4 in. wg.
  - d. Temperature: Up to 180 deg F.
  - e. Velocity: Up to 3000 fpm.
- 3. Construction:
  - a. Frame:
    - 1) End Connection: Sleeve-type connection for mating to adjacent ductwork.
    - 2) Length: Minimum 6 inches.
    - 3) Material: Galvanized steel, minimum 20 gauge thick.
    - 4) Stiffeners: Outward-turned beads positioned approximately 1-1/2 inches inboard of each end.
    - 5) Standoff: Provide 2-inch-high, sheet metal standoff for mounting actuator to axle while accommodating field-installed duct insulation.
  - b. Blade: Double-thickness circular flat blades sandwiched together and constructed of galvanized steel.
  - c. Blade Seal: EPDM, neoprene or silicone seal fully encompassing blade edge.
  - d. Axle: 0.5-inch-diameter plated steel, mechanically attached to blade.
  - e. Bearings: Bronze or stainless steel sleeve pressed into frame.

## 2.4 GENERAL CONTROL-DAMPER ACTUATORS REQUIREMENTS

- A. Select actuators to operate related damper(s) with sufficient reserve power to provide smooth two-position action and proper speed of response at velocity and pressure conditions to which the damper is subjected.
- B. Select actuators with sufficient power and torque to close off against the maximum system pressures encountered. Actuators are to be sized to close off against the fan shutoff pressure as a minimum requirement.
- C. The total damper area operated by an actuator is not to exceed 80 percent of manufacturer's maximum area rating.
- D. Provide one actuator for each damper assembly.
- E. Avoid the use of excessively oversized actuators, which could overdrive and cause linkage failure when the damper blade has reached either its full open or closed position.
- F. Use jackshafts and shaft couplings in lieu of blade-to-blade linkages when driving axially aligned damper sections.
- G. Provide mounting hardware and linkages for connecting actuator to damper.
- H. Select actuators to fail-safe in desired position in the event of a power and signal failure.
- I. Actuator Fail-Safe Positions:
  - 1. Exhaust Air: Close.

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2. Supply Air: Close.
3. Return Air: Close.

## 2.5 ELECTRIC AND ELECTRONIC CONTROL-DAMPER ACTUATORS

- 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. Belimo Aircontrols (USA), Inc.
  2. Honeywell Building Solutions; Honeywell International, Inc.
  3. Johnson Controls, Inc.
  4. Schneider Electric USA, Inc.
  5. Siemens Industry, Inc., Building Technologies Division.
- B. Source Limitations: Obtain electric and electronic control-damper actuators from single manufacturer.
- C. Type: Motor operated, with or without gears, electric and electronic.
- D. Voltage:
  1. Voltage selection is delegated to professional designing control system.
  2. Actuator to deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
  3. Actuator to function properly within a range of 85 to 120 percent of nameplate voltage.
- E. Construction:
  1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed-steel enclosures.
  2. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains are to be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
  3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.
- F. Local Field Adjustment: Make spring-return actuators easily switchable from fail-safe open to fail-safe closed in the field without replacement.
- G. Local Manual Override: Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.
- H. Two-Position Actuators: Single direction, spring return or reversing type.
- I. Position Feedback:
  1. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.
- J. Fail-Safe:
  1. Where indicated, provide actuator to fail-safe to an end position.

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2. Internal spring-return mechanism to drive controlled device to an end position (open or close) on loss of power.
- K. Integral Overload Protection:
1. Provide against overload throughout the entire operating range in both directions.
  2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.
- L. Damper Attachment:
1. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.
  2. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.
  3. Bolt and setscrew method of attachment is acceptable only if provided with at least two points of attachment.
- M. Temperature and Humidity:
1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
  2. Humidity: Suitable for humidity range encountered by application; minimum operating range is to be from 5 to 95 percent relative humidity, noncondensing.
- N. Enclosure:
1. Suitable for ambient conditions encountered by application.
  2. NEMA 250, Type 2 for indoor and protected applications.
- O. Stroke Time:
1. Select operating stroke time to be compatible with equipment and system operation.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for dampers and instruments installed in duct systems to verify actual locations of connections before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.



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3.2 CONTROL-DAMPER APPLICATIONS

- A. Select from damper types indicated to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.

3.3 INSTALLATION, GENERAL

- A. Furnish and install products required to satisfy most stringent requirements indicated.
- B. Properly support dampers and actuators, tubing, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a seismic, wind, or other forces common to the application.
- C. Seal penetrations made in fire-rated and acoustically rated assemblies.
- D. Fastening Hardware:
  - 1. Wrenches, pliers, or other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
  - 2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
  - 3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.
- E. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

3.4 CONTROL DAMPERS

- A. Clearance:
  - 1. Locate dampers for easy access and provide separate support of dampers that cannot be handled by service personnel without hoisting mechanism.
  - 2. Install dampers with at least 12 inches of clear space on sides of dampers requiring service access unless more space is recommended by manufacturer. Provide code required clearances as applicable.
- B. Service Access:
  - 1. Install dampers and actuators to be accessible for visual inspection and service.
  - 2. Install access door(s) in duct or equipment located upstream of damper to allow service personnel to hand clean any portion of damper, linkage, and actuator. Comply with requirements in Section 233300 "Air Duct Accessories."
- C. Install dampers straight and true, level in all planes, and square in all dimensions.
- D. Attach field-installed actuator(s) to damper drive shaft.

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3.5 ELECTRICAL CONNECTIONS

- A. Install electrical power to field-mounted control devices requiring electrical power.
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260523 "Control-Voltage Electrical Power Cables."
- C. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Furnish and install raceways. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems."

3.6 CONTROL CONNECTIONS

- A. Install control signal wiring to field-mounted control devices.
- B. Connect control signal wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
- C. Furnish and install raceways. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems."

3.7 CLEANING

- A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed surfaces.

3.8 STARTUP

- A. Control-Damper Checkout:
  - 1. Check installed products before continuity tests, leak tests, and calibration.
  - 2. Check dampers for proper location and accessibility.
  - 3. Verify that control dampers are installed correctly for flow direction.
  - 4. Verify that proper blade alignment, either parallel or opposed, has been provided.
  - 5. Verify that damper frame attachment is properly secured and sealed.
  - 6. Verify that damper actuator and damper linkage attachment are secure.
  - 7. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
  - 8. Verify that damper blade travel is smooth and unobstructed throughout operating range.

3.9 ADJUSTMENT, CALIBRATION, AND TESTING

- A. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

END OF SECTION

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SECTION 230923.27 - TEMPERATURE INSTRUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Air temperature sensors.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.

1.2 DEFINITIONS

- A. RTD: Resistance temperature detector.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

- B. Product Data: On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied. For the following:

1. Air temperature sensors.

- C. Product Data Submittals: For each product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation operation and maintenance instructions, including factors affecting performance.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

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- B. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Environmental Conditions:

1. Instruments shall operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.
2. Instruments and accessories shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Instruments not available with integral enclosures complying with requirements indicated shall be housed in protective secondary enclosures. Instrument's installed location shall dictate following NEMA 250 enclosure requirements:
  - a. Indoors, Heated and Air Conditioned: Type 1.

### 2.2 AIR TEMPERATURE SENSORS

A. Platinum RTDs: Common requirements:

1. 100 or 1000 ohms at 0 deg C and a temperature coefficient of 0.00385 ohm/ohm/deg C.
2. Two-wire, PTFE-insulated, 22-gage stranded copper leads.
3. Performance Characteristics:
  - a. Range: Minus 50 to 275 deg F.
  - b. Interchangeable Accuracy: At 32 deg F within 0.5 deg F.
  - c. Repeatability: Within 0.5 deg F.
  - d. Self-Heating: Negligible.
4. Transmitter Requirements:
  - a. Transmitter required for each 100-ohm RTD.
  - b. Transmitter optional for 1000-ohm RTD, contingent on compliance with end-to-end control accuracy.

B. Platinum RTD, Single-Point Air Temperature Duct Sensors:

1. 100 or 1000 ohms.
2. Temperature Range: Minus 50 to 275 deg F.
3. Probe: Single-point sensor with a stainless steel sheath.
4. Length: As required by application to achieve tip at midpoint of air tunnel, up to 18 inches long.
5. Enclosure: Junction box with removable cover; NEMA 250, Type 1 for indoor applications and Type 4 for outdoor applications.
6. Gasket for attachment to duct or equipment to seal penetration airtight.
7. Conduit Connection: 1/2-inch trade size.

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C. Thermal Resistors (Thermistors): Common requirements:

1. 10,000 ohms at 25 deg C and a temperature coefficient of 23.5 ohms/ohm/deg C.
2. Two-wire, PTFE-insulated, 22-gage stranded copper leads.
3. Performance Characteristics:
  - a. Range: Minus 50 to 275 deg F.
  - b. Interchangeable Accuracy: At 77 deg F within 0.5 deg F.
  - c. Repeatability: Within 0.5 deg F.
  - d. Drift: Within 0.5 deg F over 10 years.
  - e. Self-Heating: Negligible.
4. Transmitter optional, contingent on compliance with end-to-end control accuracy.

D. Thermistor, Single-Point Duct Air Temperature Sensors:

1. Temperature Range: Minus 50 to 275 deg F.
2. Probe: Single-point sensor with a stainless steel sheath.
3. Length: As required by application to achieve tip at midpoint of air tunnel, up to 18 inches long.
4. Enclosure: Junction box with removable cover; NEMA 250, Type 1 for indoor applications and Type 4 for outdoor applications.
5. Gasket for attachment to duct or equipment to seal penetration airtight.
6. Conduit Connection: 1/2-inch trade size.

E. Space Air Temperature Sensors for Use with DDC Controllers Controlling Terminal Units:

1. 100- or 1000-ohm platinum RTD or thermistor.
2. Thermistor:
  - a. Pre-aged, burned in, and coated with glass; inserted in a metal sleeve; and entire unit encased in epoxy.
  - b. Thermistor drift shall be less than plus or minus 0.5 deg F over 10 years.
3. Temperature Transmitter Requirements:
  - a. Mating transmitter required with each 100-ohm RTD.
  - b. Mating transmitters optional for 1000-ohm RTD and thermistor, contingent on compliance with end-to-end control accuracy.
4. Provide digital display of sensed temperature.
5. Provide sensor with local control.
  - a. Local override to turn HVAC on.
  - b. Local adjustment of temperature set point.
  - c. Both features shall be capable of manual override through control system operator.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install products level, plumb, parallel, and perpendicular with building construction.
- B. Properly support instruments, wiring, and conduit to comply with requirements indicated.
- C. Fastening Hardware:
  - 1. Stillson wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.
  - 2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
  - 3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.
- D. Install products in locations that are accessible and that permit calibration and maintenance from floor.

3.3 ELECTRICAL CONNECTIONS

- A. Furnish and install electrical power to products requiring electrical connections.
- B. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Furnish and install raceways. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems."

3.4 INSTALLATION OF TEMPERATURE INSTRUMENTS

- A. Mounting Location:
  - 1. Roughing In:
    - a. Outline instrument mounting locations before setting instruments and routing cable, wiring, tubing, and conduit to final location.

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- b. Provide independent inspection to confirm that proposed mounting locations comply with requirements indicated and approved submittals.
  - 1) Indicate dimensioned locations with mounting height for all surface-mounted products on Shop Drawings.

B. Mounting Height:

- 1. Mount temperature instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.

C. Seal penetrations to ductwork to comply with duct static-pressure class and leakage and seal classes indicated using neoprene gaskets or grommets.

D. Installation of Space Temperature Sensor:

- 1. Conceal assembly in an electrical box of sufficient size to house sensor and transmitter, if provided.
- 2. Install electrical box with a faceplate to match sensor cover if sensor cover does not completely cover electrical box.
- 3. In finished areas, recess electrical box within wall.
- 4. In unfinished areas, electrical box may be surface mounted if electrical light switches are surface mounted. Use a cast-aluminum electric box for surface-mounted installations.
- 5. Align electrical box with other electrical devices such as visual alarms and light switches located in the vicinity to provide a neat and well-thought-out arrangement. Where possible, align in both horizontal and vertical axis.

E. Installation of Single-Point Duct Temperature Sensor:

- 1. Install single-point-type, duct-mounted, supply- and return-air temperature sensors. Install sensors in ducts with sensitive portion of the element installed in center of duct cross section and located to sense near average temperature. Do not exceed 24 inches in sensor length.
- 2. Rigidly support sensor to duct and seal penetration airtight.
- 3. If required to have transmitter, mount transmitter remote from sensor at accessible and serviceable location.

### 3.5 CLEANING

- A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

### 3.6 CHECK-OUT PROCEDURES

- A. Check installed products before continuity tests, leak tests, and calibration.
- B. Check temperature instruments for proper location and accessibility.
- C. Verify sensing element type and proper material.

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- D. Verify location and length.
- E. Verify that wiring is correct and secure.

### 3.7 ADJUSTMENT, CALIBRATION, AND TESTING

#### A. Description:

1. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
2. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
3. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.
4. Equipment and procedures used for calibration shall meet instrument manufacturer's written instructions.
5. Provide diagnostic and test equipment for calibration and adjustment.
6. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.
7. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.
8. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.
9. Comply with field-testing requirements and procedures indicated by ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements and to supplement requirements indicated.

#### B. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistance source.

#### C. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

#### D. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistance source.

### 3.8 FIELD QUALITY CONTROL

#### A. Tests and Inspections: Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform according to manufacturer's written instruction.



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2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- B. Prepare test and inspection reports.

3.9 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain temperature instruments.

END OF SECTION

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SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Piping joining materials.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation are to be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:
  1. Hot-Water Heating Piping: 100 psig at 200 deg F.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tube: ASTM B88, Type L.
- B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22 pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4.
- C. Wrought-Copper Unions: ASME B16.22. Do not use solder joints on pipe sizes greater than NPS 4.

2.3 PIPING JOINING MATERIALS

- A. Solder Filler Metals: ASTM B32, lead-free alloys.
- B. Flux: ASTM B813, water flushable.

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PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-Water Heating Piping, Aboveground, NPS 2 (DN 50) and Smaller, to Be Any of the Following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- 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. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- M. Install branch connections to mains using tee fittings in main pipe.
- N. Install valves according to Section 230523 "General-Duty Valves for HVAC Piping."
- O. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- P. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

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- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."
- R. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 "Common Work Results for HVAC."

### 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 pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints in accordance with ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.
- D. Threaded Joints: Thread pipe with tapered pipe threads in accordance with 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.

### 3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.
- B. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping within 12 inches of each fitting and coupling.

### 3.5 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections are to be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.

### 3.6 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 230553 "Identification for HVAC Piping and Equipment."

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### 3.7 SYSTEM STARTUP

- A. Perform the following before operating the system:
1. Open manual valves fully.
  2. Inspect pumps for proper rotation.
  3. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
  4. Set temperature controls so all coils are calling for full flow.

### 3.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping in accordance with ASME B31.9 and as follows:
1. Leave joints uninsulated and exposed for examination during test.
  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 hydronic piping systems with clean water; then remove and clean or replace strainer screens.
  4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure is to be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
- 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 air. Use drains installed at low points for complete draining of test liquid.
  3. Isolate expansion tanks and determine that hydronic system is full of water.
  4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure is not to exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9.
  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.

END OF SECTION

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SECTION 232116 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydronic specialty valves.
2. Air vents.
3. Strainers.

B. Related Requirements:

1. Section 230523 "General-Duty Valves for HVAC Piping" for specification and installation requirements for general-duty valves common to most piping systems.
2. Section 230923.11 "Control Valves" for automatic control valve and sensor specifications, installation requirements, and locations.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied. For each type of product:

1. Include construction details and material descriptions for hydronic piping specialties.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

1.3 CLOSEOUT SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Operation and Maintenance Data: For hydronic piping specialties to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

A. Bronze, Calibrated-Orifice, Balancing Valves:

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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. Bell & Gossett; a Xylem brand.
  - b. Gerand Engineering Co.
  - c. Griswold Controls, LLC.
  - d. HCI; Hydronics Components Inc.
  - e. IMI Flow Design, Inc.
  - f. Jenkins Valves; a Crane Co. brand.
  - g. Nexus Valve, Inc.; Aalberts Hydronic Flow Control.
  - h. Taco Comfort Solutions.
  - i. Tour & Andersson; available through Victaulic Company.
  - j. WATTS; A Watts Water Technologies Company.
2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gauge Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

## 2.2 AIR VENTS

### A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
  - b. Bell & Gossett; a Xylem brand.
  - c. Caleffi North America.
  - d. Nexus Valve, Inc.; Aalberts Hydronic Flow Control.
  - e. NuTech Hydronic Specialty Products.
  - f. Taco Comfort Solutions.
  - g. WATTS; A Watts Water Technologies Company.
2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

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## 2.3 STRAINERS

### A. Y-Pattern Strainers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
  - b. Caleffi North America.
  - c. FNW; Ferguson Enterprises, Inc.
  - d. Flexicraft Industries.
  - e. Griswold Controls, LLC.
  - f. Metraflex Company (The).
  - g. Nexus Valve, Inc.; Aalberts Hydronic Flow Control.
  - h. WATTS; A Watts Water Technologies Company.
  - i. Zurn Industries, LLC.
2. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
3. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
4. Strainer Screen: Stainless steel, 40-mesh strainer, or perforated stainless steel basket.
5. CWP Rating: 125 psig.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine all piping specialties 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. Examine threads on all devices for form and cleanliness.
- C. Do not attempt to repair defective piping specialties; replace with new devices. Remove defective piping specialties from site.

### 3.2 INSTALLATION OF VALVES

- A. Install calibrated-orifice, balancing valve in the return pipe of each heating or cooling terminal.

### 3.3 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

END OF SECTION



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SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Requirements:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied. For each type of the following products:
1. Sealants and gaskets.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

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- B. Structural Performance: Duct hangers and supports are to withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

## 2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
  - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
- B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
  - 2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
  - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
- B. Source Limitations: Obtain single-wall round ducts and fittings from single manufacturer.
- C. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

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- D. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials are to be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
  - 1. Galvanized Coating Designation: G60.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.

## 2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets are to be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
- B. 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.

## 2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

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- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.
- D. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports:
  - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

### PART 3 - EXECUTION

#### 3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations.
- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and 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. Install fire dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire dampers and specific installation requirements of the damper UL listing.
- K. Install heating coils, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.

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- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."
- M. Elbows: Use long-radius elbows wherever they fit.
  - 1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
  - 2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.
- N. Branch Connections: Use lateral or conical branch connections.

### 3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead.
- C. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- D. Repair or replace damaged sections and finished work that does not comply with these requirements.

### 3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- E. 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.

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### 3.5 DUCTWORK CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099123 "Interior Painting."

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct System Cleanliness Tests:
  - 1. Visually inspect duct system to ensure that no visible contaminants are present.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.8 STARTUP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

### 3.9 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
  - 1. Fabricate all ducts to achieve SMACNA pressure class and seal class as indicated below.
- B. Supply Ducts:
  - 1. Ducts Connected to Terminal Units:
    - a. Pressure Class: Positive 1-inch wg.
    - b. Minimum SMACNA Seal Class: A.
  - 2. Ducts Connected to Variable-Air-Volume Air-Handling Units:
    - a. Pressure Class: Positive 3-inch wg.
    - b. Minimum SMACNA Seal Class: A.
- C. Return Ducts:

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1. Ducts Connected to Terminal Units:
    - a. Pressure Class: Positive or negative 1-inch wg.
    - b. Minimum SMACNA Seal Class: B.
  2. Ducts Connected to Air-Handling Units:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: A.
- D. Exhaust Ducts:
1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
    - a. Pressure Class: Negative 1-inch wg.
    - b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
- E. Elbow Configuration:
1. Rectangular Duct - Requirements for All Velocities: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
    - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
  2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
    - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
      - 1) Radius-to Diameter Ratio: 1.5.
    - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
    - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.
- F. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
    - a. Rectangular Main to Rectangular Branch: 45-degree entry.
    - b. Rectangular Main to Round Branch: Conical spin in.
  2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

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- a. Velocity 1000 fpm or Lower: 90-degree tap.
- b. Velocity 1000 to 1500 fpm: Conical tap.
- c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION



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SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Manual volume dampers.
2. Fire dampers.
3. Turning vanes.
4. Duct-mounted access doors.
5. Duct accessory hardware.

- B. Related Requirements:

1. Section 233346 "Flexible Ducts" for insulated flexible ducts.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with NFPA 90A and NFPA 90B.
- B. 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.

2.2 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:

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1. Performance:
  - a. Leakage Rating Class III: Leakage not exceeding 40 cfm/sq. ft. against 1-inch wg differential static pressure.
2. Construction:
  - a. Linkage out of airstream.
  - b. Suitable for horizontal or vertical airflow applications.
3. Frames:
  - a. Hat-shaped, 16-gauge-thick, galvanized sheet steel.
  - b. Mitered and welded corners.
  - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
4. Blades:
  - a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized steel; 16 gauge thick.
5. Blade Axles: Galvanized steel or nonferrous metal.
6. Bearings:
  - a. Oil-impregnated bronze or molded synthetic.
  - b. Dampers mounted with vertical blades to have thrust bearing at each end of every blade.
7. Tie Bars and Brackets: Galvanized steel.
8. Locking device to hold damper blades in a fixed position without vibration.

## 2.3 FIRE DAMPERS

- A. Type: Static; rated and labeled in accordance with UL 555 by an NRTL.
- B. Fire Rating: 1-1/2 hours and 3 hours, as indicated on plans.
- C. Frame: Curtain type with blades outside airstream; fabricated with roll-formed galvanized steel; with mitered and interlocking corners; gauge in accordance with UL listing.
- D. Mounting Sleeve: Factory-installed, galvanized sheet steel; gauge in accordance with UL listing.
- E. Mounting Orientation: Vertical or horizontal as indicated.
- F. Blades: Roll-formed galvanized sheet steel. Material gauge is to be in accordance with UL listing.
- G. Horizontal Dampers: Include blade lock and stainless steel closure spring.

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H. Heat-Responsive Device:

1. Replaceable, 165 deg F rated, fusible links.

2.4 TURNING VANES

A. Manufactured Turning Vanes for Metal Ducts: Fabricate curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

C. Vane Construction:

1. Double wall.

2.5 DUCT-MOUNTED ACCESS DOORS

A. Duct-Mounted Access Doors: Fabricate access panels in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 7-2 (7-2M), "Duct Access Doors and Panels," and Figure 7-3, "Access Doors - Round Duct."

1. Door:

- a. Double wall, rectangular.
- b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
- c. 24-gauge-thick galvanized steel door panel.
- d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
- e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

- a. 24-gauge-thick galvanized steel.

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: Continuous and two sash locks.

2.6 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

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- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## 2.7 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.
  - 1. Galvanized Coating Designation: G60.
  - 2. Exposed-Surface Finish: Mill phosphatized.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116 for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts.
  - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.
- F. Install fire dampers in accordance with UL listing.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  - 1. On both sides of duct coils.
  - 2. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
  - 3. Adjacent to and close enough to fire dampers, to reset or reinstall fusible links.
  - 4. Upstream from turning vanes.
  - 5. Control devices requiring inspection.
  - 6. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
  - 1. One-Hand or Inspection Access: 8 by 5 inches.
  - 2. Two-Hand Access: 12 by 6 inches.

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- 3. Head and Hand Access: 18 by 10 inches.
- J. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Operate dampers to verify full range of movement.
  - 2. Inspect locations of access doors, and verify that size and location of access doors are adequate to perform required operation.
  - 3. Operate fire dampers to verify full range of movement and that proper heat-response device is installed.
  - 4. Inspect turning vanes for proper and secure installation, and verify that vanes do not move or rattle.

END OF SECTION

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SECTION 233346 - FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flexible ducts, insulated.
2. Flexible duct connectors.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
1. Flexible ducts, insulated.
  2. Flexible duct connectors.
- C. Product Data Submittals: For each type of product.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A and NFPA 90B.
- B. 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 must be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- C. Comply with the Air Duct Council's (formerly, Air Diffusion Council) "ADC Flexible Air Duct Test Code - FD 72-R1" and "Flexible Duct Performance & Installation Standards."
- D. Comply with ASTM E96/E96M.

2.2 FLEXIBLE DUCTS, INSULATED

- A. Standard: Product is to be UL 181 listed and bearing the UL label.
- B. Flexible Ducts, Insulated - Class 1, Two-Ply Vinyl Film Supported by Helically Wound, Spring-Steel Wire; Fibrous-Glass Insulation:

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1. Pressure Rating: 10 inch wg positive and 1.0 inch wg negative.
  2. Maximum Air Velocity: 4000 fpm.
  3. Temperature Range: Minus 10 to plus 160 deg F.
  4. Insulation R-Value: R4.2.
  5. Vapor-Barrier Film: Polyethylene or aluminized.
- C. Flexible Ducts, Insulated - Class 1, Black Polymer Film Supported by Helically Wound, Spring-Steel Wire; Fibrous-Glass Insulation:
1. Pressure Rating: 4 inch wg positive and 0.5 inch wg negative.
  2. Maximum Air Velocity: 4000 fpm.
  3. Temperature Range: Minus 20 to plus 175 deg F.
  4. Insulation R-Value: R4.2.
  5. Vapor-Barrier Film: Polyethylene or aluminized.

## 2.3 FLEXIBLE DUCT CONNECTORS

- A. Clamps: Stainless steel band with stainless steel or zinc-plated hex screw to tighten band with a worm-gear action or nylon strap in sizes 3 through 18 inches, to suit duct size.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF FLEXIBLE DUCTS

- A. Install flexible ducts in accordance with applicable details in the following publications:
1. ADC's "Flexible Duct Performance & Installation Standards" for flexible ducts.
  2. NAIMA AH116.
  3. SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
- B. Install in indoor applications only. Do not install flexible duct in locations where it will be exposed to UV lighting.
- C. Connect diffusers, registers, and grille to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- D. Installation:
1. Install ducts fully extended.
  2. Do not bend ducts across sharp corners.
  3. Bends of flexible ducting must not exceed a minimum of one-duct diameter.
  4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
  5. Install flexible ducts in a direct line, without sags, twists, or turns.
  6. Install in accordance with ADC instructions.
- E. Supporting Flexible Ducts:
1. Support flexible duct at manufacturer's recommended intervals, but at no greater distance than 4 ft. Provide sufficient support so that maximum centerline sag is 1/2 in. per ft.

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- between supports. A connection to rigid duct or equipment may be considered a support joint.
2. Install extra supports at bends placed approximately one-duct diameter from center line of the bend.
  3. Ducts may rest on ceiling joists or truss supports. Spacing between supports must not exceed the maximum spacing in accordance with manufacturer's written installation instructions.
  4. Vertically installed ducts must be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION



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SECTION 233600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Modulating, single-duct air terminal units.
  2. Casing liner.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of air terminal unit. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
  2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.3 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For air terminal units 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 resetting minimum and maximum air volumes.
    - b. Instructions for adjusting software set points.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a Qualified Electrical Testing Laboratory, and marked for intended location and application.
- B. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Start-up."

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- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

## 2.2 MODULATING, SINGLE-DUCT AIR TERMINAL UNITS

- 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. Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.
  2. Carrier Global Corporation.
  3. ENVIRO-TEC; brand of Johnson Controls International plc, Building Solutions North America.
  4. Johnson Controls, Inc.
  5. METALAIRE, Inc.
  6. Price Industries Limited.
  7. Trane.
- B. Description: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.
- C. Casing: Minimum 20-gauge-thick galvanized steel.
1. Casing Liner: Comply with requirements in "Casing Liner" Article below.
  2. Air Inlet: Round stub connection 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.
- D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
1. Maximum Damper Leakage: AHRI 880 rated, 1 percent of nominal airflow at 3-inch wg inlet static pressure.
- E. Velocity Sensors: Multipoint array with velocity inlet sensors.
- F. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch. Include manual air vent and drain valve. Provide hydronic heating coils for air terminal units scheduled on Drawings.
- G. Direct Digital Controls:
1. Terminal Unit Controller, Section 230923: Controller is to be field-mounted and wired; unit controllers, integrated actuators, and room sensors to be furnished under Section 230923 "Direct Digital Controls (DDC) for HVAC."
- H. Control Sequence: See Drawings for control sequences.

## 2.3 CASING LINER

- A. Casing Liner, Fibrous Glass: Fibrous-glass duct liner, complying with ASTM C1071, NFPA 90A or NFPA 90B, and with NAIMA AH124.

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1. Minimum Thickness: 3/4 inch.
  - a. Maximum Thermal Conductivity:
    - 1) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Foil-Faced Liner: Minimum 0.001-inch reinforced, nonporous aluminum foil applied to matted insulation airstream face. Encapsulate all insulation edges with sheet metal angles and channels, or tape.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C916.

## 2.4 SOURCE QUALITY CONTROL

- A. Water Coils: Factory pressure test to 300 psig in accordance with AHRI 410 and ASHRAE 33.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Comply with Section 230529 "Hangers and Supports for HVAC Piping and Equipment" and Section 233113 "Metal Ducts" for hangers and supports.
- B. Install air terminal units according to NFPA 90A.
- C. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

### 3.2 PIPING CONNECTIONS

- A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.
- B. Hot-Water Piping: Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties," and connect heating coils to supply piping with shutoff valve, strainer, control valve, and union or flange; and to return piping with balancing valve and union or flange.

### 3.3 DUCTWORK CONNECTIONS

- A. Comply with requirements in Section 233113 "Metal Ducts" for connecting ducts to air terminal units.

### 3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.

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- B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

### 3.5 IDENTIFICATION

- A. Label each air terminal unit with drawing designation. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for equipment labels.

### 3.6 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks in accordance with 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.

### 3.7 ADJUSTING

- A. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air terminal unit testing, adjusting, and balancing.

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Leak Test: After installation, fill water coils 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.
- B. Air terminal unit will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.9 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION

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SECTION 233713.13 - AIR DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Diffusers - louver face.
2. Diffusers - ceiling-integral plenum slot.
3. Linear slot diffuser/grille assembly.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire dampers and volume-control dampers not integral to diffusers.
2. Section 233713.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
  - a. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - b. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 DIFFUSERS - LOUVER FACE

A. Diffuser - Louver Face:

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. Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.
  - b. Carnes Company.
  - c. METALAIRE, Inc.
  - d. Price Industries Limited.

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- e. Titus; brand of Johnson Controls International plc, Global Products.
- 2. Description: Square diffuser with outer border, duct collar, and curved face louvers to direct air discharge in one, two, three, or four directions, parallel to ceiling surface.
- 3. Source Limitations: Obtain from single source from single manufacturer.
- 4. Material: Steel.
- 5. Finish: Baked enamel, white.
- 6. Face Size: As scheduled on Drawings.
- 7. Mounting: T-bar.
- 8. Pattern: Four-way core style.
- 9. Accessories:
  - a. Square to round neck adaptor.

## 2.2 DIFFUSERS - CEILING-INTEGRAL PLENUM SLOT

### A. Diffuser - Ceiling-Integral Plenum Slot (S-4):

- 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. Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.
  - b. Carnes Company.
  - c. METALAIRE, Inc.
  - d. Price Industries Limited.
  - e. Titus; brand of Johnson Controls International plc, Global Products.
- 2. Description: Diffuser assembly with integral pattern controller, one or more linear discharge slots, and an integral plenum and duct collar. Assembly is to be installed surface mounted in architectural wood slat ceiling.
- 3. Source Limitations: Obtain from single source from single manufacturer.
- 4. Material:
  - a. Face: Aluminum.
  - b. Pattern Controller and Tees: Aluminum.
  - c. Plenum: Steel, internally insulated with sloped shoulders.
  - d. Plenum Insulation: Comply with UL 181.
- 5. Finish:
  - a. Face: Baked enamel, white.
  - b. Pattern Controller: Baked enamel, black.
  - c. Tees: Baked enamel, white.
- 6. Slot Width: As scheduled on Drawings.
- 7. Number of Slots: As scheduled on Drawings.
- 8. Length: As scheduled on Drawings.

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## 2.3 LINEAR SLOT DIFFUSER/GRILLE ASSEMBLY

### A. Linear Slot Diffuser/Grille Assembly (S-5/R-4):

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. Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.
  - b. Carnes Company.
  - c. METALAIRE, Inc.
  - d. Price Industries Limited.
  - e. Titus; brand of Johnson Controls International plc, Global Products.
2. Description: Diffuser section of assembly with integral pattern controller, return grille section of assembly without pattern controller, one or more linear discharge slots, manufacturer's blank off plate, and field-fabricated plenums. Assembly is to be installed surface mounted in vertical face of soffit.
3. Source Limitations: Obtain from single source from single manufacturer.
4. Material:
  - a. Face: Aluminum.
  - b. Pattern Controller and Tees: Aluminum.
  - c. Plenum: Field fabricated.
5. Finish:
  - a. Face: Baked enamel, white.
  - b. Pattern Controller: Baked enamel, black.
  - c. Tees: Baked enamel, white.
6. Slot Width: As scheduled on Drawings.
7. Number of Slots: As scheduled on Drawings.
8. Length: As scheduled on Drawings.

## 2.4 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers in accordance with ASHRAE 70.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF AIR DIFFUSERS

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

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- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION



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SECTION 233713.23 - REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Registers - fixed-blade face.
2. Grilles - fixed-blade face.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire dampers and volume-control dampers not integral to registers and grilles.
2. Section 233713.13 "Air Diffusers" for various types of air diffusers.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. For each type of product. On data submittal sheets where more than one product is described, clearly annotate which product(s) is to be supplied.
  - a. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - b. Register and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 REGISTERS

A. Registers - Fixed-Blade Face:

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. Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.
  - b. Carnes Company.
  - c. METALAIRE, Inc.
  - d. Price Industries Limited.
  - e. Titus; brand of Johnson Controls International plc, Global Products.

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2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face-Blade Arrangement: Fixed-position face blades, spacing as scheduled on Drawings.
5. Core Construction: Integral.
6. Frame: 1 inch wide.
7. Mounting: Countersunk screw.
8. Damper Type: Adjustable opposed blade.

## 2.2 GRILLES

### A. Grilles - Fixed-Blade or Perforated Face:

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. Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.
  - b. Carnes Company.
  - c. METALAIRE, Inc.
  - d. Price Industries Limited.
  - e. Titus; brand of Johnson Controls International plc, Global Products.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face-Blade Arrangement: Fixed-face blade position, or perforated, as scheduled on Drawings.
5. Core Construction: Integral.
6. Frame: 1 inch wide for fixed-face blade.
7. Mounting: Countersunk screw for fixed blade or lay in for perforated face.

## 2.3 SOURCE QUALITY CONTROL

- ### A. Verification of Performance: Rate registers and grilles in accordance with ASHRAE 70.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF REGISTERS AND GRILLES

- #### A. Install registers and grilles level and plumb.

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- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

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SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements generally applicable to all electrical Work on the Project, including but not limited to Work specified in Divisions 26, 27, and 28.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. A: Ampere, unit of electrical current.
2. AC or ac: Alternating current.
3. AFCI: Arc-fault circuit interrupter.
4. AIC: Ampere interrupting capacity.
5. AL, Al, or ALUM: Aluminum.
6. ASD: Adjustable-speed drive.
7. ATS: Automatic transfer switch.
8. AWG: American wire gauge; see ASTM B258.
9. BAS: Building automation system.
10. CATV: Community antenna television.
11. CB: Circuit breaker.
12. CU or Cu: Copper.
13. CU-AL or AL-CU: Copper-aluminum.
14. EGC: Equipment grounding conductor.
15. EMF: Electromotive force.
16. EPS: Emergency power supply.
17. EPSS: Emergency power supply system.
18. FACU: Fire-alarm control unit.
19. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
20. FLC: Full-load current.
21. ft: Foot.
22. GFCI: Ground-fault circuit interrupter.
23. GFPE: Ground-fault protection of equipment.
24. GND: Ground.
25. HDPE: High-density polyethylene.
26. HP or hp: Horsepower.
27. HVAC: Heating, ventilating, and air conditioning.
28. Hz: Hertz.
29. IP: Ingress protection rating (enclosures); Internet protocol (communications).
30. IR: Infrared.

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31. IT&R: Inspecting, testing, and repair.
32. ITE: Information technology equipment.
33. kAIC: Kiloampere interrupting capacity.
34. kcmil or MCM: One thousand circular mils.
35. kV: Kilovolt.
36. kVA: Kilovolt-ampere.
37. kvar: Kilovolt-ampere reactive.
38. kW: Kilowatt.
39. kWh: Kilowatt-hour.
40. LAN: Local area network.
41. lb: Pound (weight).
42. lbf: Pound (force).
43. LCD: Liquid-crystal display.
44. LED: Light-emitting diode.
45. Li-ion: Lithium-ion.
46. lm: Lumen, the SI-derived unit of luminous flux.
47. LRC: Locked-rotor current.
48. LV: Low voltage.
49. lx: Lux, the SI-derived unit of illuminance equal to one lumen per square meter.
50. m: Meter.
51. MCC: Motor-control center.
52. MDC: Modular data center.
53. MG set: Motor-generator set.
54. MLO: Main lugs only.
55. MPEG-2: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard for generic coding of moving pictures and associated audio information (ISO/IEC 13818) released in 1995 and used for most over-the-air and satellite broadcast digital television.
56. MPEG-4: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard framework for coding of audio-visual objects (ISO/IEC 14496) released in 1999, with digital rights management and more advanced compression algorithms than MPEG-2.
57. MV: Medium voltage.
58. MVA: Megavolt-ampere.
59. mW: Milliwatt.
60. MW: Megawatt.
61. MWh: Megawatt-hour.
62. N.C.: Normally closed.
63. Ni-Cd: Nickel-cadmium.
64. N.O.: Normally open.
65. OCPD: Overcurrent protective device.
66. ONT: Optical network terminal.
67. PC: Personal computer.
68. PCU: Power-conditioning unit.
69. PF or pf: Power factor.
70. PLC: Programmable logic controller.
71. PLFA: Power-limited fire alarm.
72. PoE: Power over Ethernet.
73. POTS: Plain old telephone service. See "public switched telephone network" definition.
74. PSTN: Public switched telephone network.
75. PV: Photovoltaic.
76. PVC: Polyvinyl chloride.
77. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.

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78. RPM or rpm: Revolutions per minute.
79. SCADA: Supervisory control and data acquisition.
80. SCCR: Short-circuit current rating.
81. SPD: Surge protective device.
82. sq.: Square.
83. SWD: Switching duty.
84. TCP/IP: Transmission Control Protocol/Internet Protocol.
85. TR: Tamper resistant.
86. UL: (standards) UL Standards & Engagement Inc.; (product categories) UL, LLC.
87. UL CCN: UL Category Control Number.
88. UPS: Uninterruptible power supply.
89. USB: Universal serial bus.
90. UV: Ultraviolet.
91. V: Volt, unit of electromotive force.
92. V(ac): Volt, alternating current.
93. V(dc): Volt, direct current.
94. VA: Volt-ampere, unit of complex electrical power.
95. VAR: Volt-ampere reactive, unit of reactive electrical power.
96. VFC: Variable-frequency controller.
97. VoIP: Voice over Internet Protocol.
98. W: Watt, unit of real electrical power.
99. WAN: Wide area network.
100. Wh: Watt-hour, unit of electrical energy usage.
101. WPT: Wireless power transfer.

B. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. EMT-S: Steel electrical metallic tubing.
3. ERMC: Electrical rigid metal conduit.
4. ERMC-S: Steel electrical rigid metal conduit.
5. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
6. FMC-A: Aluminum flexible metal conduit.
7. PVC: Rigid PVC conduit.
8. PVC-40: Schedule 40 rigid PVC conduit.
9. PVC-80: Schedule 80 rigid PVC Conduit.
10. RGS: See ERMC-S-G.
11. RMC: See ERMC.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

1. AC: Armored cable.
2. CATV: Coaxial general-purpose cable.
3. CM: Communications general-purpose cable.
4. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
5. THHW: Thermoplastic, heat- and moisture-resistant cable.
6. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
7. XHH: Cross-linked polyethylene, heat-resistant cable.
8. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Definitions:

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1. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
2. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
3. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
4. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
5. Conduit: A structure containing one or more duct raceways.
6. Direct Buried: Installed underground without encasement in concrete or other protective material.
7. Electrical Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
8. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
  - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
  - b. Concrete Box: A box intended for use in poured concrete.
  - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
  - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
  - e. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
  - f. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
  - g. Device Box: A box with provisions for mounting a wiring device directly to the box.
  - h. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
  - i. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
  - j. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
  - k. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.

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- l. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
  - m. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
  - n. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
  - o. Raised-Floor Box: A floor box intended for use in raised floors.
  - p. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
  - q. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
  - r. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
- 9. Jacket: A continuous nonmetallic outer covering for conductors or cables.
  - 10. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
  - 11. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein. Also called "single-line diagram."
  - 12. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
  - 13. Protective Device: A device that senses when an abnormal current flow, abnormal voltage potential, or other abnormal electrical waveform exists and then disconnects the affected portion of the circuit from the system. Common protective devices include fuses, circuit breakers, relays, ground-fault circuit interrupters, and arc-fault circuit interrupters.
  - 14. Public Switched Telephone Network (PSTN): Analog telephone technology that uses twisted pair cables from a telephone-provider central office for the transmission medium. "PSTN" refers to the telephone network; "POTS" refers to the individual subscriber line.
  - 15. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
  - 16. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
  - 17. Sheath: A continuous metallic covering for conductors or cables.
  - 18. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
  - 19. Voice over Internet Protocol (VoIP): Digital telephone packet technology that uses the internet for its transmission medium.
  - 20. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
    - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.



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- b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
  - c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
  - d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
  - e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
  - f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.
21. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

### 1.3 COORDINATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
- 1. Notify Architect or Owner no fewer than 14 days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without Owner's written permission.
  - 3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:
    - a. Exercising generators.
    - b. Emergency lighting.
    - c. Elevators.
    - d. Fire-alarm systems.
  - 4. Arrange to provide temporary emergency and standby electrical power so facility may remain occupied during the outage in accordance with requirements specified in Section 015000 "Temporary Facilities and Controls." Coordinate power requirements with Owner.
- B. Interruption of Existing Telephone Service: Do not interrupt telephone service to facilities occupied by Owner or others unless permitted under the following conditions:
- 1. Notify Architect or Owner no fewer than 14 days in advance of proposed interruption of telephone service.

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2. Do not proceed with interruption of telephone service without Owner's written permission.
- C. Interruption of Existing Internet Service: Do not interrupt internet service to facilities occupied by Owner or others unless permitted under the following conditions:
  1. Notify Architect or Owner no fewer than 14 days in advance of proposed interruption of internet service.
  2. Do not proceed with interruption of internet service without Owner's written permission.
- D. Interruption of Existing Security System: Do not interrupt security system to facilities occupied by Owner or others unless permitted under the following conditions:
  1. Notify Architect or Owner no fewer than 14 days in advance of proposed interruption of security system.
  2. Do not proceed with interruption of security system without Owner's written permission.
- E. Interruption of Existing Fire-Alarm System: Do not interrupt fire-alarm system to facilities occupied by Owner or others unless permitted under the following conditions:
  1. Notify Architect or Owner no fewer than 14 days in advance of proposed interruption of fire-alarm system.
  2. Do not proceed with interruption of fire-alarm system without Owner's written permission.

#### 1.4 SEQUENCING

- A. Conduct and submit results of power system studies before submitting product data and Shop Drawings for electrical equipment.

#### 1.5 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Coordination Drawings for Ceiling Areas: Where indicated on drawings, provide reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  1. Suspended ceiling components.
  2. Structural members to which equipment and suspension systems will be attached.
  3. Size and location of access panels on ceilings.
  4. Elevation, size, and route of sprinkler piping.
  5. Elevation, size, and route of plumbing piping.
  6. Elevation, size, and route of ductwork.
  7. Elevation, size, and route of cable tray.
  8. Elevation, size, and route of conduit.
  9. Elevation and size of wall-mounted and ceiling-mounted equipment.
  10. Access panels.

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11. Sprinklers.
12. Air inlets and outlets.
13. Control modules.
14. Luminaires.
15. Communications devices.
16. Speakers.
17. Security devices.
18. Fire-alarm devices.
19. Indicate clear dimensions for maintenance access in front of equipment.
20. Indicate dimensions of fully open access doors.

- C. Coordination Drawings for Conduit Routing: Conduit 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 conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect including, but not limited to, milestone dates for the following activities:

1. Submission of specified coordination drawings.
2. Submission of action submittals specified in Division 26.
3. Orders placed for major electrical equipment.
4. Arrival of major electrical equipment on-site.
5. Utility service outages.
6. Utility service inspection and activation.
7. Mockup reviews.
8. Closing of walls and ceilings containing electrical Work.
9. System startup, testing, and commissioning activities for major electrical equipment.
10. System startup, testing, and commissioning activities for emergency lighting.
11. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
12. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
13. Requests for special inspections.
14. Requests for inspections by authorities having jurisdiction.

- C. Installation Schedule for Communications Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of the communications Work to Owner and Architect including, but not limited to, milestone dates for the following activities:

1. Submission of specified coordination drawings.

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2. Submission of action submittals specified in Division 27.
  3. Orders placed for major equipment.
  4. Arrival of major equipment on-site.
  5. Telephone and internet service outages.
  6. Telephone and internet service inspection and activation.
  7. Mockup reviews.
  8. Closing of walls and ceilings containing the communications Work.
  9. System startup, testing, and commissioning activities for communications equipment.
  10. System startup, testing, and commissioning activities for the Work specified in other divisions that depends on the Work specified in Division 27.
  11. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
  12. Requests for special inspections.
  13. Requests for inspections by authorities having jurisdiction.
- D. Installation Schedule for Security, Fire-Alarm, and Other Life-Safety Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of security, fire-alarm, and the other life-safety Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
1. Submission of specified coordination drawings.
  2. Submission of action submittals specified in Division 28.
  3. Orders placed for major equipment.
  4. Arrival of major equipment on-site.
  5. Security and fire-alarm system outages.
  6. Security and fire-alarm system inspection and activation.
  7. Mockup reviews.
  8. Closing of walls and ceilings containing the security and fire-alarm Work.
  9. System startup, testing, and commissioning activities for security and fire-alarm equipment.
  10. System startup, testing, and commissioning activities for fire-alarm interfaces with the Work specified in other divisions.
  11. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
  12. Requests for special inspections.
  13. Requests for inspections by authorities having jurisdiction.
- E. Welding certificates.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data:
1. Include the following information:
    - a. Manufacturer's operating specifications.
    - b. User's guides for software and hardware.

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- c. Schedule of maintenance material items recommended to be stored at the Project site.
  - d. Detailed instructions covering operation under both normal and abnormal conditions.
  - e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
  - f. List of load-current and overload-relay heaters with related motor nameplate data.
  - g. List of lamp types and photoelectric relays used on the Project, with ANSI and manufacturers' codes.
  - h. Manufacturer's instructions for setting field-adjustable components.
  - i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
  - j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
  - k. Exterior pole inspection and repair procedures.
- C. Software and Firmware Operational Documentation: Provide software and firmware operational documentation, including the following:
- 1. Software operating and upgrade manuals.
  - 2. Names, versions, and website addresses for locations of installed software.
  - 3. Device address list.
  - 4. Printout of software application and graphic screens.
  - 5. Testing and adjusting of panic and emergency power features.
  - 6. For lighting controls, include the following:
    - a. Adjustments of scene preset controls, adjustable fade rates, and fade overrides.
    - b. Operation of adjustable zone controls.

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

- A. Substitution requests for electrical equipment will be entertained under the following conditions:
- 1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
  - 2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
  - 3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

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## 2.2 SUBSTITUTION LIMITATIONS FOR COMMUNICATIONS EQUIPMENT

- A. Substitution requests for communications equipment will be entertained under the following conditions:
  - 1. Substitution requests may be submitted for consideration prior to the Communications Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
  - 2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Communications Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

## 2.3 SUBSTITUTION LIMITATIONS FOR ELECTRONIC SAFETY AND SECURITY EQUIPMENT

- A. Substitution requests for electronic safety and security equipment will be entertained under the following conditions:
  - 1. Substitution requests may be submitted for consideration prior to the Electronic Safety and Security Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
  - 2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Electronic Safety and Security Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF ELECTRICAL WORK

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of electrical Work on the Project. Consult Architect for resolution of conflicting requirements.

### 3.2 CLOSEOUT ACTIVITIES

- A. Training:
  - 1. With assistance from factory-authorized service representatives, train Owner's maintenance personnel on the following topics:
    - a. Electrical power safety fundamentals refresher including arc-flash hazard safety features of electrical power distribution equipment in facility, interpreting arc-flash warning labels, selecting appropriate personal protective equipment.
  - 2. Provide video recordings of training sessions to Owner.

END OF SECTION

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire.
2. Metal-clad cable, Type MC.
3. Fire-alarm wire and cable.
4. Connectors and splices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
3. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cabling used for data circuits.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Copper building wire.
2. Metal-clad cable, Type MC.
3. Fire-alarm wire and cable.
4. Connectors and splices.

C. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Field quality-control reports.

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PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- 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. Alpha Wire; brand of Belden, Inc.
  2. Belden Inc.
  3. Cerro Wire LLC.
  4. Encore Wire Corporation.
  5. General Cable; Prysmian Group North America.
  6. Okonite Company (The).
  7. Service Wire Co.
  8. Southwire Company, LLC.
  9. WESCO.
- B. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Conductor Insulation:
1. Type THHN and Type THWN-2. Comply with UL 83.
  2. Type XHHW-2. Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

- 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; Atkore International.
  2. Alpha Wire; brand of Belden, Inc.
  3. Belden Inc.
  4. Encore Wire Corporation.
  5. General Cable; Prysmian Group North America.
  6. Okonite Company (The).
  7. Southwire Company, LLC.
  8. WESCO.



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- B. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. Comply with UL 1569.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
  - 1. Single circuit.
- E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- F. Ground Conductor: Bare.
- G. Conductor Insulation:
  - 1. Type TFN/THHN/THWN-2. Comply with UL 83.
- H. Armor: Steel, interlocked.

## 2.3 FIRE-ALARM WIRE AND CABLE

- 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 Wire & Cable Inc.](#)
  - 2. [CommScope, Inc.](#)
  - 3. [Comtran Corporation.](#)
  - 4. [Genesis; Resideo Technologies, Inc.](#)
  - 5. [PYROTENAX; brand of nVent Electrical plc.](#)
  - 6. [Prysmian Cables and Systems; Prysmian Group North America.](#)
  - 7. [Radix Wire.](#)
  - 8. [Rockbestos-Suprenant Cable Corp.](#)
  - 9. [Superior Essex Inc.; subsidiary of LS Corp.](#)
  - 10. [West Penn Wire; brand of Belden, Inc.](#)
- B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- C. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
  - 1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
  - 2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

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3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NTRL listed for fire-alarm and cable tray installation, plenum rated.

## 2.4 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 Electrical Products.
  2. ABB, Electrification Business.
  3. AFC Cable Systems; Aikore International.
  4. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  5. Gardner Bender.
  6. Hubbell Utility Solutions; Hubbell Incorporated.
  7. ILSCO.
  8. Ideal Industries, Inc.
  9. NSi Industries LLC.
  10. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  11. Service Wire Co.
  12. TE Connectivity Ltd.
- B. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  1. Material: Copper.
  2. Type: One hole with standard barrels.
  3. Termination: Compression.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
  1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
  1. Copper:
    - a. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

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3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway; Metal-clad cable, Type MC.
- B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway; Metal-clad cable, Type MC.

3.3 INSTALLATION, GENERAL

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points in accordance with Section 260533.13 "Conduits 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. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- G. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

3.4 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

- A. Comply with NFPA 72.
- B. Wiring Method: Install wiring in metal pathway according to Section 270528.29 "Hangers and Supports for Communications Systems."
  - 1. Install plenum cable in environmental airspaces, including plenum ceilings.
  - 2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system must be installed in a dedicated pathway system.
    - a. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.
  - 3. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is not permitted.

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- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes; cabinets; or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.
- F. Risers: Install at least two vertical cable risers to serve the fire-alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent receipt or transmission of signals from other floors or zones.
- G. Wiring to Remote Alarm Transmitting Device: 1 inch conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

### 3.5 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.
  - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.
- D. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems" for connecting, terminating, and identifying wires and cables.

### 3.6 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.

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3.7 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."

3.8 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."

3.9 FIELD QUALITY CONTROL

- A. 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 of the following visual and electrical tests:
    - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports 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.

END OF SECTION

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SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backboards.
2. Category 6 balanced twisted pair cable.
3. Balanced twisted pair cable hardware.
4. Twin-axial data highway cable.
5. RS-485 cable.
6. Control cable.
7. Control-circuit conductors.
8. Fire-alarm wire and cable.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Backboards.
2. Category 6 balanced twisted pair cable.
3. Balanced twisted pair cable hardware.
4. Twin-axial data highway cable.
5. RS-485 cable.
6. Control cable.
7. Control-circuit conductors.
8. Fire-alarm wire and cable.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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- B. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
  - 1. Flame Travel Distance: 60 inch or less.
  - 2. Peak Optical Smoke Density: 0.5 or less.
  - 3. Average Optical Smoke Density: 0.15 or less.
- C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

## 2.2 BACKBOARDS

- A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inch. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."
- B. Painting: Paint plywood on all sides and edges with flat latex paint. Comply with requirements in Section 099123 "Interior Painting."

## 2.3 CATEGORY 6 BALANCED TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250 MHz.
- 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. 3M.
  - 2. AMP NETCONNECT; a TE Connectivity Ltd. company.
  - 3. Belden Inc.
  - 4. Berk-Tek, a Leviton Company.
  - 5. CommScope, Inc.
  - 6. General Cable; Prysmian Group North America.
  - 7. Genesis; Resideo Technologies, Inc.
  - 8. Hitachi Cable America Inc.
  - 9. Mohawk; a division of Belden Networking, Inc.
  - 10. Prysmian Cables and Systems; Prysmian Group North America.
  - 11. Superior Essex Inc.; subsidiary of LS Corp.
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100 ohm, No. 23 AWG solid copper.
- E. Shielding/Screening: Unshielded twisted pairs (UTP).
- F. Cable Rating: Plenum.

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- G. Jacket: Yellow thermoplastic.

## 2.4 BALANCED TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.
- 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. 3M.
2. AMP NETCONNECT; a TE Connectivity Ltd. company.
3. American Technology Systems Industries, Inc.
4. Belden Inc.
5. Berk-Tek, a Leviton Company.
6. CommScope, Inc.
7. Dynacom Corporation.
8. General Cable; Prysmian Group North America.
9. Genesis; Resideo Technologies, Inc.
10. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
11. Leviton Manufacturing Co., Inc.
12. Mohawk; a division of Belden Networking, Inc.
13. Molex Premise Networks.
14. Panduit Corp.
15. Prysmian Cables and Systems; Prysmian Group North America.
16. Siemon Co. (The).
17. Superior Essex Inc.; subsidiary of LS Corp.

- C. General Requirements for Balanced Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 6.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables must be terminated with connecting hardware of same category or higher.

- D. Source Limitations: Obtain balanced twisted pair cable hardware from single source from single manufacturer.

- E. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

- F. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

- G. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:



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- a. Universal T568A and T568B wiring labels.
  - b. Labeling areas adjacent to conductors.
  - c. Replaceable connectors.
  - d. 24 or 48 ports.
2. Construction: 16-gauge steel and mountable on 19 inch equipment racks.
3. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.
- H. Patch Cords: Factory-made, four-pair cables in 36 inch lengths; terminated with an eight-position modular plug at each end.
  1. Patch cords must have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords must have latch guards to protect against snagging.
- I. Plugs and Plug Assemblies:
  1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
  2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
  3. Marked to indicate transmission performance.
- J. Jacks and Jack Assemblies:
  1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
  2. Designed to snap-in to a patch panel or faceplate.
  3. Standards:
    - a. Category 6, unshielded balanced twisted pair cable must comply with IEC 60603-7-4.
  4. Marked to indicate transmission performance.
- K. Faceplate:
  1. Two and four port, as indicated, vertical single-gang faceplates designed to mount to single-gang wall boxes.
  2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 260533.16 "Boxes and Covers for Electrical Systems."
  3. For use with snap-in jacks accommodating any combination of balanced twisted pair, optical fiber, and coaxial work area cords.
    - a. Flush mounting jacks, positioning the cord at a 45-degree angle.
- L. Legend:
  1. Machine printed, in the field, using adhesive-tape label.
  2. Snap-in, clear-label covers and machine-printed paper inserts.

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2.5 RS-485 CABLE

- A. Plenum-Rated Cable: NFPA 70, Type CMP.
  - 1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
  - 2. Fluorinated ethylene propylene insulation.
  - 3. Unshielded.
  - 4. Fluorinated ethylene propylene jacket.
  - 5. Flame Resistance: NFPA 262.

2.6 CONTROL CABLE

- A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
  - 1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
  - 2. PVC insulation.
  - 3. Unshielded.
  - 4. PVC jacket.
  - 5. Flame Resistance: Comply with NFPA 262.

2.7 CONTROL-CIRCUIT CONDUCTORS

- 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. Encore Wire Corporation.
  - 2. General Cable; Prysmian Group North America.
  - 3. Service Wire Co.
  - 4. Southwire Company, LLC.
- B. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- C. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

2.8 FIRE-ALARM WIRE AND CABLE

- 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 Wire & Cable Inc.
  - 2. CommScope, Inc.
  - 3. Comtran Corporation.
  - 4. Genesis; Resideo Technologies, Inc.
  - 5. Prysmian Cables and Systems; Prysmian Group North America.

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6. [Radix Wire.](#)
7. [Rockbestos-Suprenant Cable Corp.](#)
8. [Superior Essex Inc.; subsidiary of LS Corp.](#)
9. [West Penn Wire; brand of Belden, Inc.](#)

- B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- C. Signaling Line Circuits: Twisted, shielded pair, No. 18 AWG size as recommended by system manufacturer.
  1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.
- D. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
  1. Control-Voltage Circuits: No. 16 AWG, minimum, in pathway.
  2. Low-Voltage Circuits: No. 12 AWG, minimum, in pathway.
  3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NRTL listed for fire-alarm and cable tray installation, plenum rated.

## 2.9 SOURCE QUALITY CONTROL

- A. Factory test twisted pair cables according to TIA-568-C.2.
- B. Cable will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Test cables on receipt at Project site.
  1. Test each pair of twisted pair cable for open and short circuits.

### 3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems" for raceway selection and installation requirements for conduits as supplemented or modified in this Section.
- B. Comply with requirements in Section 260533.16 "Boxes and Covers for Electrical Systems" for raceway selection and installation requirements for boxes as supplemented or modified in this Section.

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1. Outlet boxes must be no smaller than 2 inch wide, 3 inch high, and 2-1/2 inch deep.
  2. Outlet boxes for cables must be no smaller than 4 inch square by 2-1/8 inch deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
  3. Flexible metal conduit must not be used.
- C. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.
- D. Install manufactured conduit sweeps and long-radius elbows if possible.
- E. Raceway Installation in Equipment Rooms:
1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
  2. Install cable trays to route cables if conduits cannot be located in these positions.
  3. Secure conduits to backboard if entering the room from overhead.
  4. Extend conduits 3 inch above finished floor.
  5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- F. Backboards: Install backboards with 96 inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
1. Comply with TIA-568-C Series of standards.
  2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
  3. Terminate all conductors; cable must not contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
  4. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
  5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
  6. Secure and support cables at intervals not exceeding 30 inch and not more than 6 inch from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
  8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
  9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
  10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
  11. Support: Do not allow cables to lie on removable ceiling tiles.

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12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
  13. Provide strain relief.
  14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
  15. Ground wire must be copper, and grounding methods must comply with IEEE C2. Demonstrate ground resistance.
- C. Balanced Twisted Pair Cable Installation:
1. Comply with TIA-568-C.2.
  2. Install termination hardware as specified in Section 271513 "Communications Copper Horizontal Cabling" unless otherwise indicated.
  3. Do not untwist balanced twisted pair cables more than 1/2 inch at the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:
1. Install wiring in raceways.
  2. Use insulated spade lugs for wire and cable connection to screw terminals.
- E. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  2. Suspend copper cable not in a wireway or pathway a minimum of 8 inch above ceilings by cable supports not more than 30 inch apart.
  3. Cable must not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.
- F. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
  2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment must be as follows:
    - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inch.
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inch.
    - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inch.
  3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment must be as follows:
    - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inch.
    - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inch.

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- c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inch.
- 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures must be as follows:
  - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
  - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inch.
  - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inch.
- 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inch.
- 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inch.

### 3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

### 3.5 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
  - 1. Class 1 remote-control and signal circuits; No 14 AWG.
  - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
  - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

### 3.6 FIRESTOPPING

- A. Comply with TIA-569-D, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping" Chapter.

### 3.7 GROUNDING

- A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For control-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

### 3.8 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

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- B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers must use label stocks, laminating adhesives, and inks complying with UL 969.
- C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.

### 3.9 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
  - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  - 3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.
    - a. Test instruments must meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding connectors.
5. Intersystem bonding bridge grounding connectors.
6. Grounding and bonding busbars.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
2. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
3. Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings" specifies additional requirements for identification and grounding and bonding of communications equipment, raceways, boxes, and cable trays.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
  - a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
  - b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
  - c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are unacceptable for submitted product.

C. Field quality-control reports.



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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

- 1. Standard Features: 600 V, THHN/THWN-2 or THWN-2, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. ASTM - Bare Copper Grounding and Bonding Conductor:

- 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. ERICO; brand of nVent Electrical plc.
  - b. Harger Lightning & Grounding; business of Harger, Inc.
- 2. Standard Features: Complying with one or more of the following:
  - a. Soft or Annealed Copper Wire: ASTM B3.
  - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
  - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
  - d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

2.3 GROUNDING AND BONDING CLAMPS

- A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.

B. UL KDER and KDSH - Hex-Fitting-Type Pipe and Rod Grounding and Bonding Clamp:

- 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. ABB, Electrification Business.
  - b. America Fujikura Ltd. (AFL); Fujikura Ltd.
  - c. Arlington Industries, Inc.
  - d. Cooper B-line; brand of Eaton, Electrical Sector.
  - e. Crouse-Hinds; brand of Eaton, Electrical Sector.

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- f. [ERICO; brand of nVent Electrical plc.](#)
  - g. [Galvan Industries, Inc.; Electrical Products Division, LLC.](#)
  - h. [Greaves Corp.; Essex Products Group, Inc.](#)
  - i. [Harger Lightning & Grounding; business of Harger, Inc.](#)
  - j. [ILSCO.](#)
  - k. [O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.](#)
  - l. [Panduit Corp.](#)
  - m. [Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.](#)
2. Source Limitations: Obtain products from single manufacturer.
  3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
    - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
  4. Standard Features:
    - a. Two pieces with zinc-plated bolts.
    - b. Clamp Material: Silicon bronze.
    - c. Listed for outdoor use.
- C. UL KDER and KDSH - U-Bolt-Type Pipe and Bonding Clamp:
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. ABB, Electrification Business.
    - b. [America Fujikura Ltd. \(AFL\); Fujikura Ltd.](#)
    - c. [Arlington Industries, Inc.](#)
    - d. [Cooper B-line; brand of Eaton, Electrical Sector.](#)
    - e. [Crouse-Hinds; brand of Eaton, Electrical Sector.](#)
    - f. [ERICO; brand of nVent Electrical plc.](#)
    - g. [Galvan Industries, Inc.; Electrical Products Division, LLC.](#)
    - h. [Greaves Corp.; Essex Products Group, Inc.](#)
    - i. [Harger Lightning & Grounding; business of Harger, Inc.](#)
    - j. [ILSCO.](#)
    - k. [O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.](#)
    - l. [Panduit Corp.](#)
    - m. [Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.](#)
  2. Source Limitations: Obtain products from single manufacturer.
  3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

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- b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
  - 4. Standard Features:
    - a. Clamp Material: Aluminum.
    - b. Listed for outdoor use.
- D. UL KDER and KDSH - Strap-Type Pipe and Rod Grounding and Bonding Clamp:
  - 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. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    - c. ERICO; brand of nVent Electrical plc.
    - d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
    - e. Panduit Corp.
  - 2. Source Limitations: Obtain products from single manufacturer.
  - 3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
    - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
  - 4. Standard Features:
    - a. Clamp Material: Aluminum.
    - b. Listed for outdoor use.
- E. UL KDER - Beam Grounding and Bonding Clamp:
  - 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. ABB, Electrification Business.
    - b. Anderson; brand of Hubbell Utility Solutions; Hubbell Incorporated.
    - c. Panduit Corp.
    - d. Penn-Union Corp.; subsidiary of Nesco, Inc.
    - e. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - 2. Source Limitations: Obtain products from single manufacturer.
  - 3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

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- a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
  - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
4. Standard Features: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.

## 2.4 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.

B. UL KDER - Bonding Bushing:

- 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. ABB, Electrification Business.
  - b. Arlington Industries, Inc.
  - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
  - d. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - f. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
- 2. Source Limitations: Obtain products from single manufacturer.
- 3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- 4. Standard Features: Threaded bushing with insulated throat.

C. UL KDER - Grounding Bushing:

- 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. ABB, Electrification Business.
  - b. Arlington Industries, Inc.
  - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
  - d. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - f. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

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2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
4. Standard Features: Threaded bushing with insulated throat and mechanical-type wire terminal.

## 2.5 GROUNDING AND BONDING HUBS

### A. UL KDER - Grounding and Bonding Hub:

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. ABB, Electrification Business.
  - b. Arlington Industries, Inc.
  - c. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - d. Crouse-Hinds; brand of Eaton, Electrical Sector.
  - e. Greaves Corp.; Essex Products Group, Inc.
  - f. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - g. Penn-Union Corp.; subsidiary of Nesco, Inc.
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
4. Standard Features: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

## 2.6 GROUNDING AND BONDING CONNECTORS

### A. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:

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. ABB, Electrification Business.
  - b. Harger Lightning & Grounding; business of Harger, Inc.
  - c. ILSCO.
2. Source Limitations: Obtain products from single manufacturer.

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3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
    - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
  4. Standard Features: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on 5/8 or 1 inch centers for two-bolt connection to busbar.
- B. UL KDER - Split-Bolt Service-Post Pressure-Type Grounding and Bonding Busbar Terminal:
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. Panduit Corp.
  2. Source Limitations: Obtain products from single manufacturer.
  3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
    - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
  4. Standard Features: Bolts that surround cable and bond to cable under compression when nut is tightened after assembly is screwed into busbar opening.
- C. UL KDER - Crimped Pressure-Type Grounding and Bonding Cable Connector:
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. ABB, Electrification Business.
    - b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - c. ILSCO.
    - d. allG Fabrication (formerly ALT).
  2. Source Limitations: Obtain products from single manufacturer.
  3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
    - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

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4. Standard Features: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.

- a. Tinned copper, C and H shaped.

D. UL KDER - Split-Bolt Pressure-Type Grounding and Bonding Cable Connector:

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. ABB, Electrification Business.
  - b. ERICO; brand of nVent Electrical plc.
  - c. Greaves Corp.; Essex Products Group, Inc.
  - d. allG Fabrication (formerly ALT).
  - e. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
  - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
4. Standard Features: Bolts that surround cable and bond to cable under compression when nut is tightened.
  - a. Tinned copper.

## 2.7 INTERSYSTEM BONDING BRIDGE GROUNDING CONNECTORS

- A. Description: Devices that provide means for connecting communications systems grounding and bonding conductors at service equipment or at disconnecting means for buildings or structures.
- B. UL KDSH - Two-Piece Intersystem Bonding Bridge Grounding Connector:
  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. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    - c. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

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- a. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
3. Standard Features: Copper body and polycarbonate cover; four terminating points.

## 2.8 GROUNDING AND BONDING BUSBARS

- A. Description: Miscellaneous grounding and bonding devices that serve as common connection for multiple grounding and bonding conductors.

- B. UL KDER - Equipment Room Grounding and Bonding Busbar:

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. Chatsworth Products, Inc.
  - b. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
  - c. Cooper B-line; brand of Eaton, Electrical Sector.
  - d. ERICO; brand of nVent Electrical plc.
  - e. Harger Lightning & Grounding; business of Harger, Inc.
  - f. Hoffman; brand of nVent Electrical plc.
  - g. ILSCO.
  - h. Panduit Corp.
  - i. allG Fabrication (formerly ALT).
  - j. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
4. Standard Features:
  - a. Bus: Rectangular bar of annealed copper.
  - b. Mounting Stand-Off Insulators: Lexan or PVC.
    - 1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.
5. Other Available Features Required by the Project:
  - a. Dimensions: 1/4 by 4 inch in cross section; length as indicated on the Drawings.
  - b. Predrilled Hole Pattern: Complying with BICSI N3 and TIA-607 9/32 inch holes spaced 1-1/8 inch apart.
  - c. Mounting Hardware: Stand-off brackets that provide 2 inch clearance to access rear of bus. Brackets and bolts must be stainless steel.

- C. UL KDER - Rack and Cabinet Bonding Busbar:



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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. Chatsworth Products, Inc.
  - b. Cooper B-line; brand of Eaton, Electrical Sector.
  - c. Harger Lightning & Grounding; business of Harger, Inc.
  - d. Hoffman; brand of nVent Electrical plc.
  - e. Panduit Corp.
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
4. Standard Features:
  - a. Bus: Rectangular bar of hard-drawn solid copper.
  - b. Predrilled Hole Pattern: Accepts connectors for grounding and bonding conductor sizes 14 AWG to 2/0 AWG.
  - c. Mounting Hardware: Stainless steel or copper-plated, for attachment to rack.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of electrical service equipment connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

#### 3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

- A. Grounding and Bonding Conductors:
  1. Provide solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
- B. Grounding and Bonding Connectors:

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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 Structural Steel: Welded connectors.
- C. Grounding and Bonding Busbars: Provide in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated on the Drawings.

### 3.3 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR COMMUNICATIONS

- A. Comply with Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings."

### 3.4 INSTALLATION OF GROUNDING AND BONDING

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
  2. Electrical Maintenance: NFPA 70B.
  3. Electrical Safety: NFPA 70E.
  4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
  5. Communications Work: BICSI N1.
  6. Work in ITE Rooms: NFPA 75.
  7. Work in Health Care Facilities: NFPA 99 and Article 517 of NFPA 70.
  8. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
  9. Work in Confined Spaces: NFPA 350.
  10. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
  11. 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.
  12. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:
1. Grounding and Bonding Conductors:
    - a. 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. Underground Grounding Conductors:
      - 1) Bury at least 30 inch below grade.
      - 2) Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.

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2. Grounding and Bonding Connectors: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
  - a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - b. Make connections with clean, bare metal at points of contact.
  - c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
  - d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
  - e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
  - f. 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 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 disconnect-type connection is required, use bolted clamp.
  - g. 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 bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where 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 bolted connector.
    - 3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
  - h. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
  - i. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 ft apart.
3. Grounding and Bonding Busbars:
  - a. Install busbar horizontally, on insulated spacers 2 inch minimum from wall, 6 inch above finished floor unless otherwise indicated.

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- b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.
- 4. Equipment Grounding and Bonding:
  - a. Install insulated equipment grounding conductors with 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 separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

### 3.5 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING

- A. Administrant for Electrical Power Tests and Inspections:
  - 1. Owner will engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
  - 2. Engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
  - 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
  - 4. Administer and perform tests and inspections with assistance of factory-authorized service representative.
- B. Field tests and inspections must be witnessed by Architect.
- 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 calibrated torque wrench in accordance with manufacturer's published instructions.

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3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by 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 in accordance with IEEE Std 81.
    - c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.
  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 record of tests and observations. Include 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. Nonconforming Work:
1. Grounding system will be considered defective if it does not pass tests and inspections.
  2. Remove and replace defective components and retest.
- E. Collect, assemble, and submit test and inspection reports.
1. Report measured ground resistances that exceed the following values:
    - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10  $\Omega$ .
    - b. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5  $\Omega$ .

### 3.6 PROTECTION

- A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

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SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Support systems.
2. Mounting, anchoring, and attachment components.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
2. Section 033000 "Cast-in-Place Concrete" specifies concrete materials, reinforcement, and placement requirements referenced by this Section.
3. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" specify cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal referenced by this Section.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
  - a. Slotted support systems, hardware, and accessories.
  - b. Clamps.
  - c. Hangers.
  - d. Sockets.
  - e. Eye nuts.
  - f. Fasteners.
  - g. Anchors.
2. Include rated capacities and furnished specialties and accessories.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Prepare design calculations in accordance with criteria specified in Section 260010 "Supplemental Requirements for Electrical" and Section 018123 "Facility Seismic and Wind Criteria."
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT SYSTEMS

- A. Steel Slotted Support Systems:
  - 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. ABB, Electrification Business.
    - b. Allied Tube & Conduit; Atkore International.
    - c. Atkore Unistrut.
    - d. CADDY; brand of nVent Electrical plc.
    - e. Cooper B-line; brand of Eaton, Electrical Sector.
    - f. Flex-Strut Inc.
    - g. G-Strut.
    - h. Gripple Inc.
    - i. Haydon Corporation.
    - j. MIRO Industries Inc.
    - k. Metal Ties Innovation.
    - l. Rocket Rack; Robroy Industries.
    - m. Wesanco/ZSi-Foster; an Ideal Tridon Group Company.
  - 2. Standard Features: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.
    - a. Referenced Standard: MFMA-4 factory-fabricated components for field assembly.
    - b. Material for Channel, Fittings, and Accessories: Galvanized steel.
    - c. Channel Width: Selected for applicable load criteria.
    - d. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
    - e. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
    - f. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
    - g. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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## 2.3 MOUNTING, ANCHORING, AND ATTACHMENT COMPONENTS

### A. Mechanical-Expansion Anchors:

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; brand of Eaton, Electrical Sector.
  - b. Empire Industries, Inc.
  - c. Hilti, Inc.
  - d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
  - e. MKT Fastening, LLC.
2. Standard Features: 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 where used.

### B. Concrete Inserts:

1. Standard Features: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

### C. Clamps for Attachment to Steel Structural Elements:

1. Standard Features: MSS SP-58 units are suitable for attached structural element.

### D. Through Bolts:

1. Standard Features: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.

### E. Toggle Bolts:

1. Standard Features: All steel springhead type.

### F. Hanger Rods:

1. Standard Features: Threaded steel.

## PART 3 - EXECUTION

### 3.1 SELECTION OF HANGERS AND SUPPORTS

- A. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as required by NFPA 70. Minimum rod size must be 1/4 inch in diameter.



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- B. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- C. 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 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
  - 1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
  - 2. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
  - 3. Installation of Steel Conduit: NECA NEIS 101.
  - 4. Installation of Aluminum Conduit: NECA NEIS 102.
  - 5. Installation of Metal Cable Tray Systems: NECA NEIS 105.
  - 6. Installation of Nonmetallic Cable Tray Systems: NECA NEIS 111.
  - 7. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
  - 1. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT may be supported by openings through structure members, in accordance with NFPA 70.
  - 2. 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 must be weight of supported components plus 200 lb.
  - 3. 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:
    - a. To Wood: Fasten with lag screws or through bolts.
    - b. To New Concrete: Bolt to concrete inserts.
    - c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
    - d. To Existing Concrete: Expansion anchor fasteners.
    - e. To Light Steel: Sheet metal screws.
    - f. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, and other devices on slotted-channel racks attached to substrate.
  - 4. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

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D. Interfaces with Other Work:

1. Touchup Finishes:

- a. 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. 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 A780.

END OF SECTION

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SECTION 260533.13 - CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT duct raceways and elbows.
2. Type ERMC duct raceways, elbows, couplings, and nipples.
3. Type FMC duct raceways.
4. Type LFMC duct raceways.
5. Fittings for conduit, tubing, and cable.
6. Joint compounds.
7. Solvent cements.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional coordination, scheduling, sequencing, submittal, and installation requirements applicable to the Work for electrical, communications, and electronic safety and security systems on the Project, including wiring methods.
2. Section 078413 "Penetration Firestopping" specifies firestopping referenced by this Section.
3. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" specifies nonmetallic underground conduit with conductors (Type NUCC).
4. Section 260529 "Hangers and Supports for Electrical Systems" specifies conduit hangers and supports referenced by this Section.
5. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels.
6. Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings" specifies additional requirements for installation of conduits for communications cabling.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT-S: Steel electrical metallic tubing.
2. ERMC-S: Steel electrical rigid metal conduit.
3. FMC-S: Steel flexible metal conduit.
4. LFMC: Liquidtight flexible metal conduit.

B. Definitions:

1. Conduit: A structure containing one or more duct raceways.
2. Direct Buried: Installed underground without encasement in concrete or other protective material.

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3. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.
4. Duct Raceway: A single enclosed raceway for conductors or cable.

### 1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Field quality-control reports.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Manufacturer's published instructions.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

### 2.2 TYPE EMT DUCT RACEWAYS AND ELBOWS

- A. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:
  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; Atkore International.
    - b. Calconduit; Atkore International.
    - c. Emerson Electric Co., Automation Solutions.
    - d. Picoma; Zekelman Industries.
    - e. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
    - f. Topaz Lighting & Electric.
    - g. Western Tube; Zekelman Industries.
    - h. Wheatland Tube; Zekelman Industries.

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2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN FJMX; including UL 797.
3. Standard Features:
  - a. Material: Steel.
  - b. Exterior Coating: Zinc.
  - c. Interior Coating: Zinc.
  - d. Minimum Trade Size: Metric designator 21 (trade size 3/4).

### 2.3 TYPE ERM C DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

- A. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERM C-S-G), Elbows, Couplings, and Nipples:
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; Atkore International.
    - b. Calconduit; Atkore International.
    - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
    - d. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - e. Patriot Aluminum Products, LLC.
    - f. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
    - g. Rymco USA brand; manufactured and listed by subsidiary Conduit S.A. de C.V.
    - h. Topaz Lighting & Electric.
    - i. Western Tube; Zekelman Industries.
    - j. Wheatland Tube; Zekelman Industries.
  2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. UL CCN DYIX; including UL 6.
  3. Standard Features:
    - a. Exterior Coating: Zinc.
    - b. Interior Coating: Zinc.
    - c. Minimum Trade Size: Metric designator 21 (trade size 3/4).

### 2.4 TYPE FMC DUCT RACEWAYS

- A. UL DXUZ - Steel Flexible Metal Conduit (FMC-S):

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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. ABB, Electrification Business.
  - b. Anaconda Sealite; Anamet Electrical, Inc.
  - c. Electri-Flex Company.
  - d. International Metal Hose Co.
  - e. Penn Aluminum Conduit & EMT; Penn Aluminum International LLC; Berkshire Hathaway.
  - f. Topaz Lighting & Electric.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN DXUZ; including UL 1.
3. Standard Features:
  - a. Material: Steel.
  - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).

## 2.5 TYPE LFMC DUCT RACEWAYS

### A. UL DXHR - Steel Liquidtight Flexible Metal Conduit (LFMC-S):

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. ABB, Electrification Business.
  - b. Anaconda Sealite; Anamet Electrical, Inc.
  - c. Electri-Flex Company.
  - d. International Metal Hose Co.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN DXHR; including UL 360.
3. Standard Features:
  - a. Material: Steel.
  - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).

## 2.6 FITTINGS FOR CONDUIT, TUBING, AND CABLE

### A. UL DWTT - Fittings for Type ERM, Duct Raceways:

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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. ABB, Electrification Business.
  - b. Appleton; Emerson Electric Co., Automation Solutions.
  - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
  - d. Konkore Fittings; Atkore International.
  - e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - f. Penn Aluminum Conduit & EMT; Penn Aluminum International LLC; Berkshire Hathaway.
  - g. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - h. Southwire Company, LLC.
  - i. Topaz Lighting & Electric.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN DWTT; including UL 514B.
3. Standard Features:
  - a. Material: Steel or die cast.
  - b. Coupling Method: Compression coupling.
  - c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

B. UL FKAV - Fittings for Type EMT Duct Raceways:

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. ABB, Electrification Business.
  - b. Allied Tube & Conduit; Atkore International.
  - c. Appleton; Emerson Electric Co., Automation Solutions.
  - d. Calconduit; Atkore International.
  - e. Crouse-Hinds; brand of Eaton, Electrical Sector.
  - f. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - g. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - h. Southwire Company, LLC.
  - i. Topaz Lighting & Electric.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN FKAV; including UL 514B.
3. Standard Features:

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- a. Material: Steel or die cast.
- b. Coupling Method: Compression coupling.
- c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

C. UL ILNR - Fittings for Type FMC Duct Raceways:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. American Fittings Corp. (AMFICO).
  - b. Liquid Tight Connector Co.
  - c. Southwire Company, LLC.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN ILNR; including UL 514B.

D. UL DXAS - Fittings for Type LFMC Duct Raceways:

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. Arlington Industries, Inc.
  - b. Liquid Tight Connector Co.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN DXAS; including UL 514B.

2.7 JOINT COMPOUNDS

A. UL FOIZ - Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit:

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. ABB, Electrification Business.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN FOIZ; including UL Subject 2419.



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PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturer's published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:
  - 1. Exposed and Subject to Physical Damage: ERM C.
  - 2. Exposed and Not Subject to Physical Damage: ERM C.
  - 3. Concealed Aboveground: ERM C.
  - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- C. Indoors:
  - 1. Hazardous Classified Locations: ERM C.
  - 2. Exposed and Subject to Physical Damage: ERM C / EMT.
  - 3. Exposed and Not Subject to Physical Damage: ERM C / EMT.
  - 4. Concealed in Ceilings and Interior Walls and Partitions: ERM C.
  - 5. Damp or Wet Locations: ERM C.
  - 6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- D. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
  - 1. ERM C and IMC: Provide threaded-type fittings unless otherwise indicated.

3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
  - 1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
  - 2. Electrical Safety: NFPA 70E.
  - 3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
  - 4. Communications Work: BICSI N1.
  - 5. Life Safety and Means of Egress Work: NFPA 101.
  - 6. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
  - 7. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
  - 8. Type ERM C-S: Article 344 of NFPA 70 and NECA NEIS 101.
  - 9. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
  - 10. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
  - 11. Expansion Fittings: NEMA FB 2.40.
  - 12. Consult Architect for resolution of conflicting requirements.

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C. Special Installation Techniques:

1. General Requirements for Installation of Duct Raceways:

- a. Complete duct raceway installation before starting conductor installation.
- b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
- c. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch of changes in direction.
- d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
- e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- f. Support conduit within 12 inch of enclosures to which attached.
- g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
- h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct 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 duct raceway enters a building or structure.
  - 3) Conduit extending from interior to exterior of building.
  - 4) Conduit extending into pressurized duct raceway and equipment.
  - 5) Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
  - 6) Where otherwise required by NFPA 70.
- i. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
- j. Keep duct raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
- k. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
- l. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
- m. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
  - 1) Termination fittings with shoulders do not require two locknuts.

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- n. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts..
- 2. Types ERM C:
  - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.
- 3. Types FMC and LFMC:
  - a. Provide a maximum of 36 inch of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
- 4. Stub-ups to Above Recessed Ceilings:
  - a. Provide EMT for duct raceways.
  - b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- 5. Expansion-Joint Fittings:
  - a. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft. Install in runs of aboveground ERM C and EMT conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.
  - b. 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.
  - c. Install expansion fittings at locations where conduits cross building or structure expansion joints.
  - d. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- 6. Duct Raceways Penetrating Rooms or Walls with Acoustical Requirements: Seal duct raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.
- 7. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.
  - a. Provide warning signs.

D. Interfaces with Other Work:

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1. Firestop penetrations of fire-rated floor and wall assemblies.
2. Provide conduit hangers and supports.

3.3 FIELD QUALITY CONTROL OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Nonconforming Work:

1. Conduit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

B. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.4 CLEANING

- A. Verify that bentonite or other drilling fluids are contained and removed, and site is restored to its original or improved condition.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

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SECTION 260533.16 - BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional coordination, scheduling, sequencing, submittal, and installation requirements applicable to the Work for electrical, communications, and electronic safety and security systems on the Project, including wiring methods.
2. Section 078413 "Penetration Firestopping" specifies materials and methods for sealing penetrations of rated walls and partitions referenced by this Section.
3. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.
4. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
5. Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings" specifies additional requirements for identification of communications equipment and cabling.

1.2 DEFINITIONS

- A. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
- B. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
1. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
  2. Concrete Box: A box intended for use in poured concrete.
  3. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
  4. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.

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5. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
  6. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
  7. Device Box: A box with provisions for mounting a wiring device directly to the box.
  8. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
  9. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
  10. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
  11. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
  12. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
  13. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
  14. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
  15. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
- C. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
- D. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.

### 1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Manufacturer's published instructions.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

- A. UL QCIT - Metallic Outlet Boxes and Covers:

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. ABB, Electrification Business.
  - b. Appleton; Emerson Electric Co., Automation Solutions.
  - c. Arlington Industries, Inc.
  - d. Crouse-Hinds; brand of Eaton, Electrical Sector.
  - e. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - f. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - g. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - h. MonoSystems, Inc.
  - i. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - j. Pass & Seymour; Legrand North America, LLC.
  - k. Patriot Aluminum Products, LLC.
  - l. Plasti-Bond; Robroy Industries.
  - m. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - n. Spring City Electrical Manufacturing Company.
  - o. Topaz Lighting & Electric.
  - p. Wiremold; Legrand North America, LLC.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN QCIT; including UL 514A.
3. Standard Features:
  - a. Box having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
  - b. Material: Sheet steel.
  - c. Sheet Metal Depth: Minimum 3.5 inch.

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4. Other Available Features Required by the Project:

- a. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.

B. UL QCIT - Metallic Conduit Bodies:

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. ABB, Electrification Business.
  - b. Appleton; Emerson Electric Co., Automation Solutions.
  - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
  - d. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - f. Pass & Seymour; Legrand North America, LLC.
  - g. Patriot Aluminum Products, LLC.
  - h. Plasti-Bond; Robroy Industries.
  - i. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - j. Topaz Lighting & Electric.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN QCIT; including UL 514A.
3. Standard Features: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

C. UL QCIT - Metallic Device Boxes:

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. ABB, Electrification Business.
  - b. Appleton; Emerson Electric Co., Automation Solutions.
  - c. Arlington Industries, Inc.
  - d. Crouse-Hinds; brand of Eaton, Electrical Sector.
  - e. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - f. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - g. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - h. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - i. Patriot Aluminum Products, LLC.
  - j. Plasti-Bond; Robroy Industries.



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- k. [Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.](#)
    - l. [Topaz Lighting & Electric.](#)
  - 2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. UL CCN QCIT; including UL 514A.
  - 3. Standard Features:
    - a. Box with provisions for mounting wiring device directly to box.
    - b. Material: Sheet steel.
    - c. Sheet Metal Depth: minimum 3.5 inch.
- D. UL QCIT - Metallic Floor Boxes and Floor Box Covers:
  - 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. [ABB, Electrification Business.](#)
    - b. [AFC Cable Systems; Atkore International.](#)
    - c. [Arlington Industries, Inc.](#)
    - d. [Arrow Hart, Wiring Devices; Eaton, Electrical Sector.](#)
    - e. [FSR Inc.](#)
    - f. [Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.](#)
    - g. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - h. [Leviton Manufacturing Co., Inc.](#)
    - i. [Pass & Seymour; Legrand North America, LLC.](#)
    - j. [Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.](#)
    - k. [Wiremold; Legrand North America, LLC.](#)
  - 2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
    - a. UL CCN QCIT; including UL 514A.
  - 3. Standard Features: Box mounted in floor with floor box cover and other components to complete floor box enclosure.
- E. UL QCIT - Metallic Concrete Boxes and Covers:
  - 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. [ABB, Electrification Business.](#)
    - b. [Crouse-Hinds; brand of Eaton, Electrical Sector.](#)

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- c. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - e. Topaz Lighting & Electric.
  - f. Wiremold; Legrand North America, LLC.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
- a. UL CCN QCIT; including UL 514A.
3. Standard Features: Box intended for use in poured concrete.

## 2.3 JUNCTION BOXES AND PULL BOXES

### A. UL BGUZ - Indoor Sheet Metal Junction and Pull Boxes:

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. Adalet.
  - b. Appleton; Emerson Electric Co., Automation Solutions.
  - c. Cooper B-line; brand of Eaton, Electrical Sector.
  - d. FSR Inc.
  - e. Hoffman; brand of nVent Electrical plc.
  - f. Hubbell Industrial Controls; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - g. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - h. Milbank Manufacturing Company.
  - i. N J Sullivan Company.
  - j. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - k. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - l. Spring City Electrical Manufacturing Company.
  - m. Square D; Schneider Electric USA.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
- a. UL CCN BGUZ; including UL 50 and UL 50E.
3. Standard Features:
- a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
  - b. Degree of Protection: Type 1.

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B. UL BGUZ - Outdoor Sheet Metal Junction and Pull Boxes:

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. Adalet.
  - b. Appleton; Emerson Electric Co., Automation Solutions.
  - c. Cooper B-line; brand of Eaton, Electrical Sector.
  - d. FSR Inc.
  - e. Hoffman; brand of nVent Electrical plc.
  - f. Hubbell Industrial Controls; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - g. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - h. Milbank Manufacturing Company.
  - i. N J Sullivan Company.
  - j. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - k. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - l. Spring City Electrical Manufacturing Company.
  - m. Square D; Schneider Electric USA.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. UL CCN BGUZ; including UL 50 and UL 50E.
3. Standard Features:
  - a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
  - b. Degree of Protection: Type 3R.

2.4 COVER PLATES FOR DEVICE BOXES

A. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:

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. ABB, Electrification Business.
  - b. Appleton; Emerson Electric Co., Automation Solutions.
  - c. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
  - d. Crouse-Hinds; brand of Eaton, Electrical Sector.
  - e. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - f. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

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- g. Intermatic, Inc.
  - h. Leviton Manufacturing Co., Inc.
  - i. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - j. Panduit Corp.
  - k. Pass & Seymour; Legrand North America, LLC.
  - l. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - m. Topaz Lighting & Electric.
  - n. Wiremold; Legrand North America, LLC.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
- a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.
3. Standard Features:
- a. Cover plate-Securing Screws: Metal with head color to match cover plate finish.
  - b. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
  - c. Cover Plate Material: Steel with white baked enamel, suitable for field painting.

### PART 3 - EXECUTION

#### 3.1 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
- B. Degree of Protection:
- 1. Outdoors:
    - a. Type 3R unless otherwise indicated.
    - b. Locations Exposed to Hosedown: Type 4X.
    - c. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
    - d. Locations in-Ground: Type 4X.
    - e. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.
  - 2. Indoors:
    - a. Type 1 unless otherwise indicated.
    - b. Damp or Dusty Locations: Type 4.
    - c. Locations Exposed to Hosedown: Type 4.

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### 3.2 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
  - 1. Electrical Construction: ICC IBC, ICC IFB, NFPA 1, NFPA 70, and NECA NEIS 1.
  - 2. Electrical Safety: NFPA 70E.
  - 3. Commissioning of Active and Passive Fire Protection Features: NFPA 3 and NFPA 4.
  - 4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
  - 5. Communications Work: BICSI N1.
  - 6. Life Safety and Means of Egress Work: NFPA 101.
  - 7. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
  - 8. Work in Confined Spaces: NFPA 350.
  - 9. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
  - 10. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
  - 11. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
  - 1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
  - 2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.
  - 3. 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, whether installed indoors or outdoors.
  - 4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
  - 5. Locate boxes so that cover or plate will not span different building finishes.
  - 6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
  - 7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
  - 8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
  - 9. Set metal floor boxes level and flush with finished floor surface.
  - 10. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
- D. Interfaces with Other Work:
  - 1. Identification: Provide labels for boxes and associated electrical equipment.
    - a. Identify field-installed conductors, interconnecting wiring, and components.
    - b. Label each enclosure with engraved metal or laminated-plastic nameplate.
    - c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

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3.3 FIELD QUALITY CONTROL OF BOXES AND COVERS

A. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. Perform tests and inspections recommended by standards listed in "Reference Standards for Installation" Paragraph.

B. Nonconforming Work:

1. Boxes and covers will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

C. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.4 CLEANING

- A. Remove construction dust and debris from boxes before installing cover plates, covers, and hoods.

3.5 PROTECTION

- A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

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SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Handholes and boxes for exterior underground wiring.

B. Related Requirements:

1. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables."
2. Section 260526 "Grounding and Bonding for Electrical Systems."

1.2 DEFINITIONS

- A. Duct: A single raceway or multiple raceways, installed singly or as components of a duct bank.
- B. Duct Bank: Two or more ducts installed in parallel, direct buried or with additional casing materials such as concrete.
- C. Handhole: An underground chamber containing electrical cables, sized such that personnel are not required to enter in order to access the cables.
- D. GRC: Galvanized rigid (steel) conduit.
- E. RNC: Rigid-nonmetallic conduit.
- F. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

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- B. Manufacturers' published instructions.
- C. Field Reports:
  - 1. Manufacturer's field reports for field quality-control support.

#### 1.5 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 according to requirements indicated:
  - 1. Notify Owner no fewer than five days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without Owner's written permission.
- B. Ground Water: Assume ground-water level is at 3-feet-below grade.

### PART 2 - PRODUCTS

#### 2.1 METAL CONDUIT AND FITTINGS

- A. GRC: Comply with ANSI C80.1 and UL 6, Schedule 40.
- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

#### 2.2 RIGID NONMETALLIC DUCT

- A. Underground Plastic Utilities Duct: Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.
- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

#### 2.3 SOLVENT CEMENTS

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - 2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL CCN DWTT.



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## 2.4 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
- B. Underground-Line Warning Tape: In accordance with Section 312000 "Earth Moving."

## 2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - 2. General Characteristics:
    - a. SCTE 77, Tier 15.
- B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover:
  - 1. Description: Molded of sand, concrete, and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or combination.
  - 2. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
  - 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and installed location.
    - a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
    - b. Cover Legend: Molded lettering, "ELECTRIC" or "COMMUNICATIONS" as indicated.
  - 4. Options:
    - a. Color: Gray or green.
- C. Fiberglass Handholes and Boxes with Polymer Concrete Frame and Cover:
  - 1. Description: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.
  - 2. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
  - 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
    - a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
    - b. Cover Legend: Molded lettering, "ELECTRIC" or "COMMUNICATIONS" as indicated.
  - 4. Options:

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- a. Color: Gray or green.

D. Fiberglass Handholes and Boxes:

1. Description: Molded of fiberglass-reinforced polyester resin, with covers made of polymer concrete or reinforced fiberglass.
2. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  - a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
  - b. Cover Legend: Molded lettering, "ELECTRIC" or "COMMUNICATIONS" as indicated.
4. Options:
  - a. Color: Gray or green.

E. High-Density Polyethylene (HDPE) Boxes:

1. Description: Injection molded of HDPE or copolymer-polypropylene. Cover must be made of polymer concrete or plastic.
2. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  - a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
  - b. Cover Legend: Molded lettering, "ELECTRIC" or "COMMUNICATIONS" as indicated.
4. Options:
  - a. Color: Gray or green.

## 2.6 UTILITY STRUCTURE ACCESSORIES

- A. Description: Utility equipment and accessory items used for utility structure access and utility support, listed and labeled for intended use and application.

## 2.7 DUCT SEALING

- A. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Compound must be capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals. Duct sealing compound must be removable without damaging ducts or cables.

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2.8 SOURCE QUALITY CONTROL

- A. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  - 1. Duct-bank materials, including spacers and miscellaneous components.
  - 2. Ducts, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
  - 3. Handholes and boxes.
- B. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Owner if there is conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct 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 and duct bank will drain to manholes and handholes, and as approved by Owner.
- C. Clear and grub vegetation to be removed, and protect vegetation to remain in accordance with Section 311000 "Site Clearing." Remove topsoil in accordance with Section 311000 "Site Clearing."

3.2 SELECTION OF UNDERGROUND DUCTS

- A. Aboveground Conduit: GRC, unless indicated otherwise.
- B. Duct for Electrical Feeders 600 V and Less: Type EPC-40-PVC RNC, direct buried unless otherwise indicated.
- C. Duct for Electrical Branch Circuits: Type EPC-40-PVC RNC, direct buried unless otherwise indicated.

3.3 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

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- B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated.
- C. Restore areas disturbed by trenching, cable laying, and other work. Restore vegetation and include necessary topsoiling, seeding, and mulching. Comply with Section 329200 "Turf and Grasses."
- D. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures as indicated.

### 3.4 INSTALLATION OF DUCTS AND DUCT BANKS

- A. Reference Standards:
  - 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA TCB 2 for installation of underground ducts and duct banks.
  - 2. Consult Owner for resolution of conflicting requirements.
- B. Special Techniques:
  - 1. Where indicated on Drawings, install duct, spacers, and accessories into duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
  - 2. Slope: Pitch duct minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from high point between two manholes to drain in both directions.
  - 3. Curves and Bends:
    - a. Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with minimum radius of 48 inch, both horizontally and vertically, at other locations unless otherwise indicated.
  - 4. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane.
  - 5. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15 psig hydrostatic pressure.
  - 6. Pulling Cord: Install 200 lbf test nylon cord in empty ducts.
  - 7. Direct-Buried Duct and Duct Bank:
    - a. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inch in nominal diameter.
    - b. Width: As indicated.
    - c. Depth: As indicated.
    - d. Install duct with minimum of 3 inch between ducts for like services and 12 inch between power and communications duct.

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- e. Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  - f. After installing first tier of duct, 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. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill, 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.
- 8. Underground-Line Warning Tape: Bury conducting underground line specified in Section 312000 "Earth Moving" no less than approximately 12 inches below grade. Align tape parallel to and within 3 inch of centerline of duct bank.
  - 9. Ground ducts and duct banks in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

### 3.5 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

#### A. Reference Standards:

- 1. Install in accordance with manufacturer's written instructions for surface type where the handhole or box is located.
- 2. Consult Owner for resolution of conflicting requirements.

#### B. Special Techniques:

- 1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
- 2. Unless otherwise indicated, support units on level bed of crushed stone or gravel, compacted to same density as adjacent undisturbed earth.
- 3. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
- 4. Ground handholes and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

### 3.6 FIELD QUALITY CONTROL

#### A. Perform the following tests and Inspections:

- 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
- 2. Test 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."

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B. Nonconforming Work:

1. Underground ducts, raceways, and structures will be considered defective if they do not pass tests and inspections.
2. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.7 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

END OF SECTION

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SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Sleeve-seal systems.
3. Grout.
4. Pourable sealants.
5. Foam sealants.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Steel Wall Sleeves:

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, LLC.
  - b. CCI Piping Systems.
  - c. Flexicraft Industries.
  - d. GPT; a division of EnPRO Industries.
  - e. Specified Technologies Inc.

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2. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

## 2.2 SLEEVE-SEAL 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. Advance Products & Systems, LLC.
  2. American Polywater Corporation.
  3. BWM Company.
  4. CALPICO, Inc.
  5. Flexicraft Industries.
  6. GPT; a division of EnPRO Industries.
  7. Metraflex Company (The).
  8. Proco Products, Inc.
  9. Roxtec Inc.
- B. General Characteristics: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

## 2.3 GROUT

- 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. W. R. Meadows, Inc.
- B. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
  1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
  2. Design Mix: 5000 psi, 28-day compressive strength.
  3. Packaging: Premixed and factory packaged.

## 2.4 POURABLE SEALANTS

- 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. Carlisle Syntec Systems.
  2. GAF.
  3. Johns Manville; a Berkshire Hathaway company.
  4. Specified Technologies Inc.
- B. Performance Criteria:



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1. General Characteristics: Single-component, neutral-curing elastomeric sealants of grade indicated below.
  - a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

## 2.5 FOAM SEALANTS

- 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. Innovative Chemical Products (Building Solutions Group).
  2. The Dow Chemical Company.
- B. Performance Criteria:
  1. General Characteristics: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. 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 space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
    - b. 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."
  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 system 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 inch above finished floor level. Install sleeves during erection of floors.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:
  1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

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2. Seal space outside of sleeves with approved joint compound for wall assemblies.
- C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- E. Underground, Exterior-Wall and Floor Penetrations:
  1. Install steel pipe sleeves. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Grout sleeve into wall or floor opening.

### 3.2 INSTALLATION OF SLEEVE-SEAL SYSTEMS

- 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.

END OF SECTION

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Bands.
3. Tapes.
4. Signs.
5. Cable ties.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 LABELS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN PGDQ2 for components; including UL 969.

- B. UL PGDQ2 - Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

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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. Brady Corporation.
    - b. Champion America.
    - c. Grafoplast Wire Markers.
    - d. HellermannTyton.
    - e. LEM Products Inc.
    - f. Marking Services Inc.
    - g. Panduit Corp.
    - h. Seton Identification Products; a Brady Corporation company.
    - i. emedco.
- C. UL PGDQ2 - Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, polyester or vinyl flexible label with acrylic pressure-sensitive adhesive.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. A'n D Cable Products.
    - b. Brady Corporation.
    - c. Brother International Corporation.
    - d. Grafoplast Wire Markers.
    - e. Ideal Industries, Inc.
    - f. LEM Products Inc.
    - g. Marking Services Inc.
    - h. Panduit Corp.
    - i. Seton Identification Products; a Brady Corporation company.
    - j. emedco.
  2. Self-Lamination: Clear; UV-, weather-, and chemical-resistant; self-laminating, with protective shield over legend. Size labels such that clear shield overlaps entire printed legend.
  3. Marker for Labels:
    - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
    - b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- D. UL PGDQ2 - Self-Adhesive Labels: Polyester or vinyl, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. A'n D Cable Products.
    - b. Brady Corporation.
    - c. Brother International Corporation.

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- d. [Grafoplast Wire Markers.](#)
  - e. [HellermannTyton.](#)
  - f. [Ideal Industries, Inc.](#)
  - g. [LEM Products Inc.](#)
  - h. [Marking Services Inc.](#)
  - i. [Panduit Corp.](#)
  - j. [Seton Identification Products; a Brady Corporation company.](#)
  - k. [emedco.](#)
2. Minimum Nominal Size:
- a. 1-1/2 by 6 inch for raceway and conductors.
  - b. 3-1/2 by 5 inch for equipment.
  - c. As required by authorities having jurisdiction.

## 2.2 BANDS

- A. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
- 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. [Brady Corporation.](#)
    - b. [HellermannTyton.](#)
    - c. [Marking Services Inc.](#)
    - d. [Panduit Corp.](#)
    - e. [Seton Identification Products; a Brady Corporation company.](#)
- B. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inch long, with diameters sized to suit diameters and that stay in place by gripping action.
- 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. [Brady Corporation.](#)
    - b. [HellermannTyton.](#)
    - c. [Marking Services Inc.](#)
    - d. [Panduit Corp.](#)

## 2.3 TAPES

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- 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. Brady Corporation.

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- b. [Carlton Industries, LP.](#)
  - c. [Champion America.](#)
  - d. [HellermannTyton.](#)
  - e. [Ideal Industries, Inc.](#)
  - f. [Marking Services Inc.](#)
  - g. [Panduit Corp.](#)
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.
  - 1. [Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. [Brady Corporation.](#)
    - b. [Carlton Industries, LP.](#)
    - c. [Marking Services Inc.](#)
    - d. [emedco.](#)
- C. Tape: 4 inch wide black stripes on 10 inch centers placed diagonally over orange background and are 12 inch wide. Stop stripes at legends.
  - 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. [HellermannTyton.](#)
    - b. [LEM Products Inc.](#)
    - c. [Marking Services Inc.](#)
    - d. [Pipemarket.com; Brimar Industries, Inc.](#)
    - e. [Seton Identification Products; a Brady Corporation company.](#)

## 2.4 CABLE TIES

- 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. [HellermannTyton.](#)
  - 2. [Ideal Industries, Inc.](#)
  - 3. [Marking Services Inc.](#)
  - 4. [Panduit Corp.](#)
- B. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria: UL CCN ZODZ; including UL 1565 or UL 62275.
- C. UL ZODZ - General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

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1. Minimum Width: 3/16 inch.
  2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
  3. Temperature Range: Minus 40 to plus 185 deg F.
  4. Color: Black, except where used for color-coding.
- D. UL ZODZ - UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
  2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
  3. Temperature Range: Minus 40 to plus 185 deg F.
  4. Color: Black.
- E. UL ZODZ - Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
1. Minimum Width: 3/16 inch.
  2. Tensile Strength at 73 deg F in accordance with ASTM D638: 7000 psi.
  3. UL 94 Flame Rating: 94V-0.
  4. Temperature Range: Minus 50 to plus 284 deg F.
  5. Color: Black.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

#### 3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

- A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:
1. Fire-protection and fire-alarm equipment must be finished, painted, or suitably marked safety red.
  2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.
- B. Pipe and Conduit Labeling: Comply with ASME A13.1 and IEEE C2.
- C. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
1. Color must be factory applied or field applied for sizes larger than 6 AWG when permitted by authorities having jurisdiction.
  2. Colors for 208Y/120 V Circuits:
    - a. Phase A: Black.

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- b. Phase B: Red.
  - c. Phase C: Blue.
- 3. Colors for 480Y/277 V Circuits:
  - a. Phase A: Brown.
  - b. Phase B: Orange.
  - c. Phase C: Yellow.
- 4. Color for Neutral (Grounded Conductor): White.
- 5. Color for Equipment Ground: Green.
- 6. Color for Isolated Ground: Green with two or more yellow stripes.
- D. Color-Coding Raceways, Cable Trays, Junction Boxes, and Conductors for Intrinsically-Safe Circuits: Light blue. When used to identify intrinsically-safe circuits, Article 504 of NFPA 70 requires that the color light blue not be used for any other purpose.
- E. Color-Coding Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.
- F. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
  - 1. "EMERGENCY POWER."
  - 2. "POWER."
  - 3. "UPS."
- G. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- H. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
  - 2. Identify system voltage and system or service type with black letters on orange field.
- I. Equipment Identification Labels:
  - 1. Black letters on white field.
  - 2. Indoor Equipment: Self-adhesive label.
  - 3. Outdoor Equipment: Laminated acrylic or melamine sign.
  - 4. Equipment to Be Labeled:
    - a. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels.
    - b. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of self-adhesive, engraved, engraved, laminated acrylic or melamine label.
    - c. Enclosures and electrical cabinets.
    - d. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.



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- e. Substations.
- 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. Uninterruptible power supplies.
- p. Battery-inverter units.
- q. Battery racks.
- r. Power-generating units.
- s. Monitoring and control equipment.

J. Cable Ties: General purpose, for attaching tags, except as listed below:

- 1. Outdoors: UV-stabilized nylon.
- 2. In Spaces Handling Environmental Air: Plenum rated.

### 3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.

B. Signs, labels, and tags required for personnel safety must comply with the following standards:

- 1. Safety Colors: NEMA Z535.1.
- 2. Facility Safety Signs: NEMA Z535.2.
- 3. Safety Symbols: NEMA Z535.3.
- 4. Product Safety Signs and Labels: NEMA Z535.4.
- 5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

C. Electrical Hazard Warnings:

- 1. Arc-Flash Hazard Warning: Self-adhesive labels. Comply with NFPA 70E requirements for arc-flash hazard warning labels.
- 2. Multiple Power Sources Warning Legend: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
- 3. OSHA Workspace Clearance Warning Legend: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

- 1. Apply to exterior of door, cover, or other access.
- 2. 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.

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b. Controls with external control power connections.

E. Operating Instruction Signs: Self-adhesive labels.

### 3.4 SELECTION OF IDENTIFICATION PRODUCTS FOR COMMUNICATIONS, CONTROL, AUXILIARY, AND LIFE SAFETY SYSTEMS

A. Comply with Section 270528 "Pathways for Communications Systems" and Section 271100 "Communications Equipment Room Fittings."

### 3.5 INSTALLATION

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Verify identity of item before installing identification products.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

G. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.

H. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

I. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.

J. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.

K. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.

L. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

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1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- M. Tape: Comply with requirements in painting Sections for surface preparation and paint application.

END OF SECTION

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SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Outdoor photoelectric switches.
2. Daylight-harvesting controls.
3. Indoor occupancy and vacancy sensors.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional coordination, scheduling, sequencing, submittal, and installation requirements applicable to the Work for electrical, communications, and electronic safety and security systems on the Project, including wiring methods.
2. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding of lighting control devices referenced by this Section.
3. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers and supports referenced by this Section.
4. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs referenced by this Section.
5. Section 262726 "Wiring Devices" for wall-box dimmers and manual light switches.

1.2 DEFINITIONS

- A. BCELTS: Branch circuit emergency lighting transfer switch.
- B. DPDT: Double pole double throw.
- C. DPST: Double pole single throw.
- D. N.C.: Normally closed.
- E. N.O.: Normally open.
- F. PIR: Passive infrared.
- G. SPDT: Single pole double throw.
- H. SPST: Single pole single throw.

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### 1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
  - 1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
    - a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
    - b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
    - c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are unacceptable for submitted product.
- C. Shop Drawings: Prepare and submit the following:
  - 1. Show installation details for the following:
    - a. Occupancy sensors.
    - b. Vacancy sensors.
  - 2. Interconnection diagrams showing field-installed wiring.
  - 3. Diagrams for power, signal, and control wiring.
- D. Field quality-control reports.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Manufacturer's published instructions.

### 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Warranty documentation.
- C. Software and firmware service agreement.

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## 1.6 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that installed lighting control devices perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.
  - 1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that lighting control devices perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.
  - 1. Failures include, but are not limited to, the following:
    - a. Faulty operation of lighting control software.
    - b. Faulty operation of lighting control devices.
  - 2. Initial Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.
  - 3. Follow-On Extended-Warranty Period: Eight years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements:
  - 1. Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Must comply with CCR Title 24.

### 2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- A. UL WJFX - Solid-State Outdoor Photoelectric Switch, Flexible Mounting:
  - 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.
    - b. Intermatic, Inc.
    - c. Leviton Manufacturing Co., Inc.
    - d. NSi Industries LLC.
    - e. TE Connectivity Ltd.

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- f. nLight; Acuity Brands Lighting, Inc.
- 2. Source Limitations: Obtain products from single manufacturer.
- 3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Plug-in, Locking-Type Photocontrols: UL CCN WJFX, including UL 773.
- 4. Standard Features:
  - a. Solid state, with SPST dry contacts rated for 1800 VA inductive, to operate connected relay, contactor coils, or microprocessor input; and compatible with drivers and LED lamps.
  - b. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - c. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
  - d. Time Delay: Fifteen-second minimum, to prevent false operation.
  - e. Mounting: Twist lock complies with ANSI C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
  - f. Failure Mode: Luminaire stays ON.

B. UL WJFX - Solid-State Outdoor Photoelectric Switch, Luminaire-Mounted:

- 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.
  - b. Intermatic, Inc.
  - c. Leviton Manufacturing Co., Inc.
  - d. NSi Industries LLC.
  - e. TE Connectivity Ltd.
  - f. nLight; Acuity Brands Lighting, Inc.
- 2. Source Limitations: Obtain products from single manufacturer.
- 3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Plug-in, Locking-Type Photocontrols: UL CCN WJFX, including UL 773.
- 4. Standard Features:
  - a. Solid state, with SPST dry contacts rated for 1800 VA inductive, to operate connected load, and compatible with CFL and LED lamps.
  - b. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
  - c. Time Delay: Thirty-second minimum, to prevent false operation.

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- d. Mounting: Twist lock complying with ANSI C136.10, with base.
- e. Failure Mode: Luminaire stays ON.

C. UL WJFX - Solid-State, Low-Voltage, Outdoor Photoelectric Switch:

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.
  - b. Intermatic, Inc.
  - c. Leviton Manufacturing Co., Inc.
  - d. NSi Industries LLC.
  - e. TE Connectivity Ltd.
  - f. nLight; Acuity Brands Lighting, Inc.
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Plug-in, Locking-Type Photocontrols: UL CCN WJFX, including UL 773.
4. Standard Features:
  - a. Solid state; one set of N.O. dry contacts rated for 24 V(ac) at 1 A, to operate connected load, and compatible with lighting control panelboard.
  - b. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
  - c. Time Delay: Thirty-second minimum, to prevent false operation.
  - d. Mounting: 1/2 inch threaded male conduit.
  - e. Failure Mode: Luminaire stays ON.
  - f. Power Pack:
    - 1) Dry contacts rated for 20 A LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
      - a) LED status lights to indicate load status.
      - b) Plenum rated.

## 2.3 DAYLIGHT-HARVESTING CONTROLS

A. UL WJCT - Daylight-Harvesting Digital Control Dimmer:

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. Deep Roof Lighting.
  - b. Eaton.



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- c. Hubbell Control Solutions; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - d. Leviton Manufacturing Co., Inc.
  - e. Lithonia Lighting; Acuity Brands Lighting, Inc.
  - f. WattStopper; Legrand North America, LLC.
  - g. nLight; Acuity Brands Lighting, Inc.
- 2. Source Limitations: Obtain products from single manufacturer.
- 3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Photoelectric Switches: UL CCN WJCT, including UL 773A.
- 4. Standard Features:
  - a. Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, lights are dimmed.
  - b. System programming is done with two handheld, remote-control tools.
    - 1) Initial setup tool.
    - 2) Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.
  - c. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with integrated power pack, to detect changes in indoor lighting levels that are perceived by the eye.
  - d. Sensor Output: 0-10 V(dc) to operate luminaires. Sensor is powered by controller unit.
  - e. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.
- 5. Sequence of Operation: Lighting control set point is based on the following two lighting conditions:
  - a. When no daylight is present (target level).
  - b. When significant daylight is present.

## 2.4 INDOOR OCCUPANCY AND VACANCY SENSORS

### A. Dual-Technology, Passive-Infrared (PIR) and Ultrasonic, Occupancy or Vacancy Sensor:

- 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 Lighting Solutions; Signify North America Corp.
  - b. HLI Solutions; brand of GE Current, a Daintree Company.
- 2. Source Limitations: Obtain products from single manufacturer.

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3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for one of the following UL product categories:
  - a. Energy Management Equipment: UL CCN PAZX, including UL 916 or UL 60730-1.
  - b. Appliance Controls: UL CCN ATNZ, including UL 60730-1.
  - c. Intrusion Detection Units: UL CCN ANSR, including UL 639.
4. Standard Features:
  - a. Wall and ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
  - b. Integrated or separate power pack.
  - c. Hardwired connection to switch; and BAS and lighting control system.
  - d. Sensitivity Adjustment: Separate for each sensing technology.
5. Operation:
  - a. Occupancy Sensor: 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.
  - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  - c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

B. Wall-Switch Occupancy Sensor:

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. Bryant; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - b. Douglas Lighting Controls.
  - c. Eaton.
  - d. Hubbell Control Solutions; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - e. Intermatic, Inc.
  - f. Leviton Manufacturing Co., Inc.
  - g. Lithonia Lighting; Acuity Brands Lighting, Inc.
  - h. Lutron Electronics Co., Inc.
  - i. NSi Industries LLC.
  - j. Philips; Signify North America; Signify Holding.
  - k. RAB Lighting.
  - l. Sensor Switch, Inc.
  - m. Square D; Schneider Electric USA.
  - n. WattStopper; Legrand North America, LLC.
  - o. nLight; Acuity Brands Lighting, Inc.

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2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for one of the following UL product categories:
  - a. Photoelectric Controls: UL CCN WJCT, including UL 773A.
  - b. Energy Management Equipment: UL CCN PAZX, including UL 916 or UL 60730-1.
  - c. Intrusion Detection Units: UL CCN ANSR, including UL 639.
4. Standard Features:
  - a. Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in single gang switchbox.
    - 1) Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
    - 2) Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
    - 3) Switch Rating: Not less than 800 VA, 1200 VA LED load at 277 V.
  - b. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.
  - c. Sensing Technology: Dual technology - PIR and ultrasonic.
  - d. Switch Type: Single pole, field-selectable automatic "on," or manual "on," automatic "off."
  - e. Capable of controlling load in three-way application.
  - f. Voltage: Match circuit voltage.
  - g. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. Switch prevents lights from turning on when light level is higher than set point of sensor.
  - h. Time Delay:
    - 1) Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
    - 2) Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
  - i. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
  - j. Color: White.
  - k. Faceplate: Color matched to switch.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

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- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SELECTION OF CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than 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 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 than 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 INSTALLATION OF LIGHTING CONTROL DEVICES

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
  - 1. Electrical Construction: ICC IBC, ICC IFB, NFPA 1, NFPA 70, and NECA NEIS 1.
  - 2. Electrical Maintenance: NFPA 70B.
  - 3. Electrical Safety: NFPA 70E.
  - 4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
  - 5. Communications Work: BICSI N1.
  - 6. Life Safety and Means of Egress Work: NFPA 101.
  - 7. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
  - 1. 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.
  - 2. 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 instructions.
  - 3. Installation of Industrial Control Switches: 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.
  - 4. Installation of Wiring:
    - a. Conduit: Minimum conduit size is 1/2 inch.
    - b. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's published instructions.

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- c. Size conductors in accordance with lighting control device manufacturer's published instructions unless otherwise indicated.
- d. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

D. Interfaces with Other Work:

- 1. Identification: Provide labels for lighting control devices and associated electrical equipment.
  - a. Identify field-installed conductors, interconnecting wiring, and components.
  - b. Label each enclosure with engraved metal or laminated-plastic nameplate.
  - c. Identify controlled circuits in lighting contactors.
  - d. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
  - e. Label time switches and contactors with a unique designation.

### 3.4 FIELD QUALITY CONTROL

A. Administrant for Lighting Tests and Inspections:

- 1. Owner will engage qualified lighting testing and inspecting agency to administer and perform tests and inspections.
- 2. Engage qualified lighting testing and inspecting agency to administer and perform tests and inspections.
- 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
- 4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

B. 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.

C. Nonconforming Work:

- 1. Lighting control devices will be considered defective if they do not pass tests and inspections.
- 2. Remove and replace defective units and retest.

D. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

E. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.

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1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to the Project site during other-than-normal occupancy hours for this purpose. Some of the Work may be required during hours of darkness.
  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.

3.6 MAINTENANCE

- A. Software and Firmware Service Agreement:
  1. Technical Support: Beginning at Substantial Completion, verify that software and firmware service agreement includes software support for two years.

END OF SECTION

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SECTION 260936 - MODULAR DIMMING CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall-box multiscene dimming controls.
2. Conductors and cables.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

1.2 DEFINITIONS

- A. Fade Rate: The time it takes each zone to arrive at the next scene, dependent on the degree of change in lighting level.
- B. Scene: The lighting effect created by adjusting several zones of lighting to the desired intensity.
- C. SCR: Silicon-controlled rectifier.
- D. Zone: A luminaire or group of luminaires controlled simultaneously as a single entity. Also known as a "channel."

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
1. Wall-box multiscene dimming controls.
  2. Conductors and cables.
- C. Shop Drawings: Detail assemblies of standard components, custom assembled for specific application on Project. Indicate dimensions, weights, arrangement of components, and clearance and access requirements.

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1. Include elevation views of front panels of control and indicating devices and control stations.
2. Include diagrams for power, signal, and control wiring.
3. Address Drawing: Reflected ceiling plan and floor plans, showing connected luminaires, address for each luminaire, and luminaire groups. Base plans on construction plans, using the same legend, symbols, and schedules.
4. Wire Termination Diagrams and Schedules: Coordinate nomenclature and presentation with Drawings and block diagram. Differentiate between manufacturer-installed and field-installed wiring.
5. Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in Section 230923 "Direct Digital Control (DDC) System for HVAC".
  - a. Show interconnecting signal and control wiring, and interface devices that show compatibility of inputs and outputs.
  - b. For control interfaces and adapters, list network protocols and provide statements from manufacturers that input and output devices comply with interoperability requirements of the protocol.

D. Field quality-control reports.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Sample Warranty: For special warranty.

#### 1.5 WARRANTY

- A. Special Manufacturer Extended Warranty: Manufacturer warrants that components of modular dimming controls perform in accordance with specified requirements and agrees to provide repair or replacement of components that fail to perform as specified within extended warranty period.
  1. Initial Extended Warranty Period: Four year(s) from date of Substantial Completion, for labor, materials, and equipment.
  2. Follow-on Extended Warranty Period: Eight year(s) from date of Substantial Completion, for materials that failed because of transient voltage surges only, f.o.b. the nearest shipping point to Project site.

### PART 2 - PRODUCTS

#### 2.1 MODULAR DIMMING CONTROLS

- 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:



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1. [Douglas Lighting Controls.](#)
2. [Leviton Manufacturing Co., Inc.](#)
3. Lutron Electronics Co., Inc.
4. [Philips; Signify North America; Signify Holding.](#)

## 2.2 SYSTEM DESCRIPTION

### A. Compatibility:

1. Dimming control components must be compatible with luminaires.
2. Dimming control devices must be compatible with lighting control system components specified in Section 260943.16 "Addressable Luminaire Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls," and in Section 260923 "Lighting Control Devices."

### B. Dimmers and Dimmer Modules: Comply with UL 508.

1. Audible Noise and RFI Suppression: Solid-state dimmers must operate smoothly over their operating ranges without audible lamp or dimmer noise or RFI. Modules must include integral or external filters to suppress audible noise and RFI.
2. Dimmer or Dimmer-Module Rating: Not less than 125 percent of connected load unless otherwise indicated.

### C. Capacities: Unit must be rated for 2000 W at 120 V(ac) for up to 100 devices or zones.

### D. Surge Protection: Withstand supply power surges without impairment to performance.

1. Panels: 6000 V, 3000 A, complying with IEEE C62.41.1 and IEEE C62.41.2.
2. Other System Devices: 6000 V, 3000 A, complying with IEEE C62.41.1 and IEEE C62.41.2.

### E. Off Control Position: User-selected off position of any control point must disconnect the load from line supply.

### F. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

## 2.3 WALL-BOX MULTISCENE DIMMING CONTROLS

### A. Description: Factory-fabricated equipment providing manual dimming consisting of a wall-box-mounted master controller. Controls and dimmers must be integrated for mounting in multigang wall box under a single wall plate. Each zone must be adjustable to indicated number of scenes, which must reside in the memory of zone controller.

### B. Dimmers:

1. Each zone must be configurable to control the following loads:
  - a. Fluorescent lamps with electronic ballasts.
  - b. LED lamps.

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- c. Incandescent lamps.
  - d. Control-voltage lamps, derived with electronic transformers.
  - e. Non-dim, on-off switching only.
- 2. Regulate voltages to maintain a constant light level, with no visible flicker, when the source voltage varies plus or minus 2 percent of RMS voltage.
- C. Memory:
  - 1. Retain preset scenes and fade rates through momentary (up to 3 s) power interruptions.
  - 2. Retain preset scenes through power failures for at least seven days.
- D. Device Cover Plates: Style, material, and color must comply with Section 260533.16 "Boxes and Covers for Electrical Systems". Master-control cover plate must be one piece.
- E. Master controller must include the following:
  - 1. Cover-mounted switches, including master off, all bright, and selectors for each scene.
  - 2. Cover-mounted LED indicator lights, one associated with each scene switch, and one for the master off switch.
  - 3. Concealed switches and indicators for specified function.
  - 4. A raise/lower switch for each zone for temporary adjustments of the zone, without altering scene values stored in memory.
  - 5. Fade time indicated by digital display for current scene while fading.
  - 6. Cover-mounted infrared receiver.

## 2.4 CONDUCTORS AND CABLES

- A. 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. Class 2 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF WIRING

- A. Wiring Method: Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables" and Section 260533.13 "Conduits for Electrical Systems."
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.
- C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.

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- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

### 3.2 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Label each dimmer module with a unique designation.
- C. Label each scene control button with approved scene description.

### 3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Continuity tests of circuits.
  - 2. Operational Test: Set and operate controls to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
    - a. Include testing of modular dimming control equipment under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.
- B. Nonconforming Work:
  - 1. Dimming control components will be considered defective if they do not pass tests and inspections.
  - 2. Remove and replace defective units and retest.
- C. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
- D. Reports: Prepare written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.
- E. Manufacturer Services:
  - 1. Engage factory-authorized service representative to support field tests and inspections.

END OF SECTION

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SECTION 260943.23 - RELAY-BASED LIGHTING CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lighting control relay panels.
2. Networked lighting control panels.
3. Manual switches and cover plates.
4. Field-mounted signal sources.
5. Conductors and cables.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

- A. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control modules, power distribution components, relays, manual switches and cover plates, and conductors and cables.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Sound data including results of operational tests of central dimming controls.
4. Operational documentation for software and firmware.

C. Shop Drawings: For each relay panel 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 Type 1.
3. Detail wiring partition configuration, current, and voltage ratings.

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4. Short-circuit current rating of relays.
5. Address Drawing: Reflected ceiling plan and floor plans, showing connected luminaires, address for each luminaire, and luminaire groups. Base plans on construction plans, using the same legend, symbols, and schedules.
6. Point List and Data Bus Load: Summary list of all control devices, sensors, ballasts, and other loads. Include percentage of rated connected load and device addresses.
7. Wire Termination Diagrams and Schedules: Coordinate nomenclature and presentation with Drawings and block diagram. Differentiate between manufacturer-installed and field-installed wiring.
8. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.

D. Field quality-control reports.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Sample warranties.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle and prepare panels for installation in accordance with NECA 407.

#### 1.6 WARRANTY

- A. Special Manufacturer Extended Warranty: Manufacturer warrants that components of standalone multipreset modular dimming controls perform in accordance with specified requirements and agrees to provide repair or replacement of components that fail to perform as specified within extended warranty period.
  1. Initial Extended Warranty Period: Four year(s) from date of Substantial Completion, for labor, materials, and equipment.
  2. Follow-on Extended Warranty Period: Eight year(s) from date of Substantial Completion, for materials that failed because of transient voltage surges only, f.o.b. the nearest shipping point to Project site.

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PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Sequence of Operations: Input signal from field-mounted manual switches, or digital signal sources, must open or close one or more lighting control relays in the lighting control panels. Any combination of inputs must be programmable to any number of control relays.
- B. Surge Protective Device: Factory installed as an integral part of control components or field-mounted surge suppressors complying with UL 1449, SPD Type 2.
- C. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
- D. Comply with 47 CFR 15, Subparts A and B, for Class A digital devices.
- E. Comply with UL 916.

2.2 LIGHTING CONTROL RELAY PANELS

- 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. ABB, Electrification Business.
  - 2. Intermatic, Inc.
  - 3. Leviton Manufacturing Co., Inc.
  - 4. Lithonia Lighting; Acuity Brands Lighting, Inc.
  - 5. Lutron Electronics Co., Inc.
  - 6. Philips; Signify North America; Signify Holding.
  - 7. Siemens Industry, Inc., Energy Management Division.
  - 8. Touch-Plate Technologies.
  - 9. WattStopper; Legrand North America, LLC.
- B. Description: Standalone lighting control panel using mechanically latched relays to control lighting and appliances.
- C. Lighting Control Panel:
  - 1. A single enclosure with incoming lighting branch circuits, control circuits, switching relays, and on-board timing and control unit.
  - 2. A vertical barrier separating branch circuits from control wiring.
- D. Control Unit: Contain the power supply and electronic control for operating and monitoring individual relays.
  - 1. Timing Unit:
    - a. 365-day calendar, astronomical clock, and automatic adjustments for daylight savings and leap year.

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- b. Clock configurable for 12-hour (A.M./P.M.) or 24-hour format.
    - c. Four independent schedules, each having 24 time periods.
    - d. Schedule periods settable to the minute.
    - e. Day-of-week, day-of-month, day-of-year with one-time or repeating capability.
    - f. 10 special date periods.
  - 2. Sequencing Control with Override:
    - a. Automatic sequenced on and off switching of selected relays at times set at the timing unit, allowing timed overrides from external switches.
    - b. Sequencing control must operate relays one at a time, completing the operation of all connected relays in not more than 10 seconds.
    - c. Override control must allow any relay connected to it to be switched on or off by a field-deployed manual switch or by an automatic switch, such as an occupancy sensor.
    - d. Override control "blink warning" must warn occupants approximately five minutes before actuating the off sequence.
  - 3. Nonvolatile memory must retain all setup configurations. After a power failure, the controller must automatically reboot and return to normal system operation, including accurate time of day and date.
- E. Relays:
- 1. Electrically operated, mechanically held single-pole switch, rated at 20 A at 277 V. Short-circuit current rating must be not less than 5 kA. Control must be three-wire, 24 V(ac).
  - 2. Electrically operated, mechanically held single-pole switch, rated at 20 A at 120 V for tungsten, 30 A at 277 V for ballast, 1.5 hp at 120 V, and 3 hp at 277 V. Short-circuit current rating must be not less than 14 kA. Control must be three-wire, 24 V(ac).
- F. Power Supply: NFPA 70, Class 2, sized for connected equipment, plus 20 percent spare capacity. Powered from a dedicated branch circuit of the panelboard that supplies power to the line side of the relays, sized to provide control power for the local panel-mounted relays, bus system, control-voltage inputs, field-installed occupancy sensors, and photo sensors.
- G. Operator Interface:
- 1. Integral alphanumeric keypad and digital display, and intuitive drop-down menus to assist in programming.
  - 2. Log and display relay on-time.
  - 3. Connect relays to one or more time and sequencing schemes.

## 2.3 NETWORKED LIGHTING CONTROL PANELS

- 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. ABB, Electrification Business.
  - 2. Intermatic, Inc.
  - 3. Lithonia Lighting; Acuity Brands Lighting, Inc.

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4. Lutron Electronics Co., Inc.
  5. [Touch-Plate Technologies.](#)
  6. [WattStopper; Legrand North America, LLC.](#)
- B. Description: Lighting control panels using mechanically latched relays to control lighting and appliances. The panels must be capable of being interconnected with digital communications to appear to the operator as a single lighting control system.
- C. Lighting Control Panels:
1. A single enclosure with incoming lighting branch circuits, control circuits, switching relays, and on-board timing and control unit.
  2. A vertical barrier separating branch circuits from control wiring.
- D. Main Control Unit: Installed in the main lighting control panel only; powered from the branch circuit of the standard control unit.
1. Ethernet Communications: Comply with TCP/IP protocol. The main control unit must provide for programming of all control functions of the main and all networked slave lighting control panels including timing, sequencing, and overriding.
  2. Protocol: Controllers must support serial MS/TP and Ethernet IP communications in accordance with ASHRAE 135, and must be able to communicate directly via DDC system for HVAC TIA-485 serial networks and Ethernet 10Base-T networks as a native device.
  3. Web Server: Display information listed below over a standard Web-enabled server for displaying information over a standard browser.
    - a. A secure, password-protected login screen for modifying operational parameters, accessible to authorized users via Web page interface.
    - b. Panel summary showing the master and slave panels connected to the controller.
    - c. Controller diagnostic information.
    - d. Show front panel mimic screens for setting up controller parameters, input types, zones, and operating schedules. These mimic screens must also allow direct breaker control and zone overrides.
4. Timing Unit:
- a. 365-day calendar, astronomical clock, and automatic adjustments for daylight savings and leap year.
  - b. Clock configurable for 12-hour (A.M./P.M.) or 24-hour format.
  - c. Four independent schedules, each having 24 time periods.
  - d. Schedule periods settable to the minute.
  - e. Day-of-week, day-of-month, day-of-year with one-time or repeating capability.
  - f. 16 special date periods.
5. Time Synchronization: The timing unit must be updated not less than every 12 hour(s) with the network time server.
6. Sequencing Control with Override:
- a. Automatic sequenced on and off switching of selected relays at times set at the timing unit, allowing timed overrides from external switches.



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- b. Sequencing control must operate relays one at a time, completing the operation of all connected relays in not more than 10 seconds.
  - c. Override control must allow any relay connected to it to be switched on or off by a field-deployed manual switch or by an automatic switch, such as an occupancy sensor.
  - d. Override control "blinking warning" must warn occupants approximately five minutes before actuating the off sequence.
  - e. Activity log, storing previous relay operation, including the time and cause of the change of status.
  - f. Download firmware to the latest version offered by manufacturer.
- E. Standard Control Unit, Installed in All Lighting Control Panels: Contain electronic controls for programming the operation of the relays in the control panel, contain the status of relays, and contain communications link to enable the digital functions of the main control unit. Comply with UL 916.
  - 1. Electronic control for operating and monitoring individual relays, and display relay on-time.
  - 2. Nonvolatile memory must retain all setup configurations. After a power failure, the controller must automatically reboot and return to normal system operation.
  - 3. Integral keypad and digital-display front panel for local setup, including the following:
    - a. Blink notice, time adjustable from software.
    - b. Ability to log and display relay on-time.
    - c. Capability for accepting downloadable firmware so that the latest production features may be added in the future without replacing the module.
- F. Relays:
  - 1. Electrically operated, mechanically held single-pole switch, rated at 20 A at 277 V. Short-circuit current rating must be not less than 5 kA. Control must be digital control network.
  - 2. Electrically operated, mechanically held single-pole switch, rated at 20 A at 120 V for tungsten, 30 A at 277 V for ballast, 1.5 hp at 120 V, and 3 hp at 277 V. Short-circuit current rating must be not less than 14 kA. Control must be digital control network.
- G. Power Supply: NFPA 70, Class 2, UL listed, sized for connected equipment, plus not less than 20 percent spare capacity. Powered from a dedicated branch circuit of the panelboard that supplies power to the line side of the relays, sized to provide control power for the local panel-mounted relays, bus system, control-voltage inputs, field-installed occupancy sensors, and control-voltage photo sensors.
- H. Operator Interface: At the main control unit, provide interface for a tethered connection of a portable PC running MS Windows for configuring all networked lighting control panels using setup software designed for the specified operating system. Include one portable device for initial programming of the system and training of Owner's personnel. That device must remain the property of Owner.
- I. Software:
  - 1. Menu-driven data entry.
  - 2. Online and offline programming and editing.

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3. Provide for entry of the room or space designation for the load side of each relay.
4. Monitor and control all relays, showing actual relay state and the name of the automatic actuating control, if any.
5. Size the software appropriate to the system.

## 2.4 MANUAL SWITCHES AND COVER PLATES

- A. Push-Button Switches: Modular, momentary contact, three wire, for operating one or more relays and to override automatic controls.
  1. Match color and style specified in Section 262726 "Wiring Devices."
  2. Integral green LED pilot light to indicate when circuit is on.
  3. Internal white LED locator light to illuminate when circuit is off.
- B. Cover Plates: Single and multigang cover plates as specified in Section 262726 "Wiring Devices."
- C. Legend: Engraved or permanently silk-screened on cover plate where indicated. Use designations indicated on Drawings.

## 2.5 FIELD-MOUNTED SIGNAL SOURCES

- A. Daylight Harvesting Switching Controls: Comply with Section 260923 "Lighting Control Devices." Control power may be taken from the lighting control panel, and signal must be compatible with the relays.
- B. Indoor Occupancy Sensors and Extreme-Temperature Occupancy Sensors: Comply with Section 260923 "Lighting Control Devices." Control power may be taken from the lighting control panel, and signal must be compatible with the relays.

## 2.6 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Class 2 Power Source: 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 Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."
- C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."
- D. Twisted-Pair Data Cable: Category 6.
  1. Comply with requirements for twisted pair cabling in Section 260523 "Control-Voltage Electrical Power Cables."
  2. Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling."

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panels in accordance with NECA 407.
- B. Examine panels before installation. Reject panels that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panels 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 OF WIRING

- A. Wiring Methods:
  - 1. Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters.
  - 2. Install cables in raceways and cable trays except within consoles, cabinets, desks, counters, accessible ceiling spaces, and gypsum board partitions where unenclosed wiring method may be used.
  - 3. Install conductors and cables concealed in accessible ceilings, walls, and floors where possible.
  - 4. Conceal raceway and cables except in unfinished spaces.
  - 5. Provide plenum-rated cable, where installed exposed or in open cable tray, within environmental airspaces, including plenum ceilings.
  - 6. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3 INSTALLATION OF PANELS

- A. Install panels and accessories in accordance with NECA 407.
- B. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inch above finished floor unless otherwise indicated.
- D. Mount panel cabinet plumb and rigid without distortion of box.
- E. Install filler plates in unused spaces.

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### 3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."
- C. Create a directory to indicate loads served by each relay; incorporate Owner's final room designations. Obtain approval before installing. Use a PC or typewriter to create directory; handwritten directories are unacceptable.
- D. Lighting Control Panel Nameplates: Label each panel with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### 3.5 FIELD QUALITY CONTROL

- A. Field tests must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers described below. Certify compliance with manufacturer's test parameters.
    - a. Circuit-Breaker Tests:
      - 1) Compare nameplate with Drawings and Specifications.
      - 2) Inspect physical and mechanical conditions.
      - 3) Inspect anchorage and alignment.
      - 4) Verify that the units are clean.
      - 5) Operate the circuit breaker to ensure smooth operation.
      - 6) Inspect bolted electrical connections for high resistance using one or more of the following methods:
        - a) A low-resistance ohmmeter.
        - b) Verify tightness of bolted electrical connections by calibrated torque wrench.
        - c) Thermographic survey.
      - 7) Inspect operating mechanism, contacts, and arc chutes in unsealed units.
      - 8) Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data.
      - 9) Verify correct operation of auxiliary features such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free, anti-pump function, and trip unit battery condition. Reset trip logs and indicators.
      - 10) Verify operation of charging mechanism.
- C. Nonconforming Work:

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1. Lighting control panel will be considered defective if it does not pass tests and inspections.
  2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Prepare test and inspection reports, including a certified report that identifies lighting control panels and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.
- E. Manufacturer Services:
1. Engage factory-authorized service representative to support field tests and inspections.

### 3.6 SYSTEM STARTUP

- A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks in accordance with manufacturer's instructions.
  2. Confirm correct communications wiring, initiate communications between panels, and program the lighting control system in accordance with approved configuration schedules, time-of-day schedules, and input override assignments.

### 3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

### 3.8 MAINTENANCE

- A. Software and Firmware Service Agreement:
1. Technical Support: Beginning at Substantial Completion, verify that software and firmware service agreement includes software support for two years.
  2. Upgrade Service: At Substantial Completion, update software and firmware to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Verify upgrading software includes operating system and new or revised licenses for using software.
    - a. Upgrade Notice: No fewer than 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.
  3. Upgrade Reports: Prepare written report after each update, documenting upgrades installed.

END OF SECTION

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SECTION 262416 – PANELBOARD CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Disconnecting and overcurrent protective devices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other requirements applicable to the Work for electrical, communications, and electronic safety and security systems on Project, including wiring methods.
2. Section 260529 "Hangers and Supports for Electrical Systems" specifies concrete bases and supports for panelboards installed by this Section.
3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
4. Section 262813 "Fuses" specifies fuses and spare-fuse cabinets installed by this Section.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product. In addition to information identified in Section 013300 "Submittal Procedures," submit the following:

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
2. Include manufacturer's sample extended warranty language.

C. Shop Drawings: For each panelboard and related equipment:

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.

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4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series rating of installed devices.
7. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.
11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device. Include Internet link for electronic access to downloadable PDF of coordination curves.

D. Field quality-control reports.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- C. Manufacturer's published instructions.
- D. Field Reports:
  1. Manufacturer's field reports for field quality-control support.
  2. Field reports for voltage monitoring and adjusting.
  3. Field reports for infrared scanning.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Warranty documentation.

#### 1.6 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 in accordance with NECA 407 and NEMA PB 1.

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## 1.7 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.
  - 1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that panelboards perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.
  - 1. Initial Extended-Warranty Period: Four years from date of Substantial Completion; full coverage for labor, materials, and equipment.
  - 2. Follow-On Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Fabricate and test panelboards in accordance with IEEE 344 to withstand seismic forces specified in Section 018123 "Facility Seismic and Wind Criteria."
- C. 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.
- D. Comply with NEMA PB 1.
- E. Enclosures: Flush and Surface-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: UL 50E, Type 1.
    - b. Other Wet or Damp Indoor Locations: UL 50E, Type 4.
    - c. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 5.
  - 2. Height: 7 ft maximum.
  - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims must cover live parts and may have no exposed hardware.
  - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.



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5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
  6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
  7. 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: Same finish as panels and trim.
    - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
- F. Phase, Neutral, and Ground Buses:
1. Material: Tin-plated aluminum.
    - a. Plating must run entire length of bus.
    - b. Bus must be fully rated for entire length.
  2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.
  3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- G. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Tin-plated aluminum.
  2. Terminations must allow use of 75 deg C rated conductors without derating.
  3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
  4. Main and Neutral Lugs: Compression type, with lug on neutral bar for each pole in panelboard.
  5. Ground Lugs and Bus-Configured Terminators: Compression type, with lug on bar for each pole in panelboard.
- H. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- I. Future Devices: Panelboards or load centers must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: 10 percent.
- J. Panelboard Short-Circuit Current Rating:
1. Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by qualified electrical testing laboratory recognized by authorities having jurisdiction. Include label or manual with size and type of allowable

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upstream and branch devices listed and labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series-connected short-circuit rating.

- a. Panelboards rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.
  - b. Panelboards rated above 240 V and less than 600 V must have short-circuit ratings as shown on Drawings, but not less than 14 000 A(rms) symmetrical.
2. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.
    - a. Panelboards and overcurrent protective devices rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.
    - b. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V must have short-circuit ratings as shown on Drawings, but not less than 14 000 A(rms) symmetrical.

## 2.2 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. ABB, Electrification Business.
  2. Eaton.
  3. Siemens Industry, Inc., Energy Management Division.
  4. Square D; Schneider Electric USA.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
  1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
  2. MCCB Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Breaker handle indicates tripped status.
    - c. UL listed for reverse connection without restrictive line or load ratings.
    - d. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
    - e. Application Listing: Appropriate for application.
    - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Reference Standards: Install according to NECA 407.
- C. Special Techniques:
  - 1. Install overcurrent protective devices and controllers not already factory installed.
    - a. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.
- D. Install filler plates in unused spaces.
- E. Arrange conductors in gutters into groups and bundles and wrap with wire ties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components.
- B. Circuit Directory:
  - 1. Provide directory card inside panelboard door, mounted in transparent card holder.
    - a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.
  - 2. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
    - a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.
  - 3. Create directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

3.3 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-use switches.
2. General-grade duplex straight-blade receptacles.
3. Receptacles with ground-fault protective devices.
4. Connectors, cords, and plugs.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260923 "Lighting Control Devices" for occupancy sensors, timers, control-voltage switches, and control-voltage dimmers.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. General-use switches.
2. General-grade duplex straight-blade receptacles.
3. Receptacles with ground-fault protective devices.
4. Connectors, cords, and plugs.

C. Shop Drawings:

1. Wiring diagrams for duplex straight-blade receptacles with integral switching means.

D. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL-USE SWITCHES

A. Toggle Switch:

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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. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
  - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour; Legrand North America, LLC.
2. Regulatory Requirements:
  - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
3. General Characteristics:
  - a. Reference Standards: UL CCN WMUZ and UL 20.
4. Options:
  - a. Device Color: White.
  - b. Configuration:
    - 1) General-duty, 120-277 V, 20 A, single pole.
5. Accessories:
  - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
  - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

## 2.2 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

### A. Duplex Straight-Blade Receptacle:

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. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
  - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour; Legrand North America, LLC.
2. Regulatory Requirements:

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- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- 3. General Characteristics:
  - a. Reference Standards: UL CCN RTRT and UL 498.
- 4. Options:
  - a. Device Color: White.
  - b. Configuration:
    - 1) General-duty, NEMA 6-20R.
- 5. Accessories:
  - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
  - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

## 2.3 RECEPTACLES WITH GROUND-FAULT PROTECTIVE DEVICES

### A. General-Grade, Weather-Resistant, Duplex Straight-Blade Receptacle with GFCI Device:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
  - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour; Legrand North America, LLC.
- 2. Regulatory Requirements:
  - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- 3. General Characteristics:
  - a. Reference Standards: UL CCN KCXS, UL 498, and UL 943.
- 4. Options:
  - a. Device Color: White.
  - b. Configuration: Heavy-duty, NEMA 5-20R.
- 5. Accessories:

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- a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
- b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receptacles:

- 1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF SWITCHES

A. Comply with manufacturer's instructions.

B. Reference Standards:

- 1. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
- 2. Consult Architect for resolution of conflicting requirements.

C. Identification:

- 1. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

3.3 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's instructions.

B. Reference Standards:

- 1. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
- 2. Consult Architect for resolution of conflicting requirements.

C. Identification:

- 1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."
  - a. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

D. Interfaces with Other Work:

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1. Do not install Type 3 SPD, including surge-protected relocatable taps and power strips, on branch circuit downstream of GFCI device.

### 3.4 FIELD QUALITY CONTROL OF SWITCHES

#### A. Tests and Inspections:

1. Perform tests and inspections in accordance with manufacturers' instructions.

#### B. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

#### C. Assemble and submit test and inspection reports.

### 3.5 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

#### A. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.
6. Perform additional installation and maintenance inspections and diagnostic tests in accordance with NECA NEIS 130 and manufacturers' instructions.

#### B. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

#### C. Assemble and submit test and inspection reports.

### 3.6 ADJUSTING

- #### A. Occupancy Adjustments for Controlled Receptacles:
- When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

### 3.7 PROTECTION

#### A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.



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2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

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SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonrenewable cartridge fuses.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
2. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs referenced by this Section.

1.2 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product. 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 PDF format.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.3 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.

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## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

### 2.2 NONRENEWABLE CARTRIDGE FUSES

- A. Class RK5 Nonrenewable Cartridge Fuse:

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. Bussmann, an Eaton business.
  - b. Edison; a brand of Bussmann by Eaton.
  - c. Littelfuse, Inc.
  - d. Mersen USA.
2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by a qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
  - a. Cartridge Fuses, Nonrenewable: UL CCN JDDZ, including UL 248-1 and UL 248-12 (Class R).
4. Standard Features:
  - a. NEMA FU 1, Class RK5, 200 kA(sym) interrupt rating, current limiting, sizes up to 600 A, 250 V(ac), with rejection feature.
    - 1) Select ferrule terminals or knife blade terminals to match equipment where fuse is installed.

## 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.

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- 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.

3.2 INSTALLATION OF FUSES

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
  - 1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
  - 2. Electrical Maintenance: NFPA 70B.
  - 3. Electrical Safety: NFPA 70E.
  - 4. Work in Confined Spaces: NFPA 350.
  - 5. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
  - 6. Fuse Applications: NECA NEIS 420.
  - 7. Work with Fuses in Motor Control Centers: NECA NEIS 402.
- C. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

END OF SECTION

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SECTION 262816 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

- A. GFEP: Ground-fault circuit-interrupter for equipment protection.
- B. GFLS: Ground-fault circuit-interrupter for life safety.
- C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Include evidence of qualified electrical testing laboratory listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
7. 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. Provide in PDF electronic format.

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C. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Warranty documentation.

1.5 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.
  1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.
  1. Extended-Warranty Period: Three years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain products 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 in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

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## 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. ABB, Electrification Business.
  2. Eaton.
  3. Siemens Industry, Inc., Energy Management Division.
  4. Square D; Schneider Electric USA.
- B. Type HD, Heavy Duty:
1. Double throw.
  2. Three pole.
  3. 600 V(ac).
  4. 200 A and smaller.
  5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
  6. 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. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  3. Lugs: Mechanical type, suitable for number, size, and conductor material.

## 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. ABB, Electrification Business.
  2. Eaton.
  3. Siemens Industry, Inc., Energy Management Division.
  4. Square D; Schneider Electric USA.
- B. Type HD, Heavy Duty, Three Pole, Single Throw, 600 V(ac), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  3. Lugs: Mechanical type, suitable for number, size, and conductor material.

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## 2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: Enclosure must be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (UL 50E Type 1), a brush finish on Type 304 stainless steel (UL 50E Type 4-4X stainless steel), and copper-free cast aluminum alloy (UL 50E Types 7, 9).
- C. Conduit Entry: UL 50E Types 4 and 4X enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: Circuit-breaker operating handle must be directly operable through front cover of enclosure (UL 50E Type 1). Cover interlock mechanism must have externally operated override. Override may not permanently disable interlock mechanism, which must return to locked position once override is released. Tool used to override cover interlock mechanism must not be required to enter enclosure in order to override interlock.

## 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.
  - 1. Commencement of work will indicate Installer's acceptance of areas and conditions as satisfactory.

### 3.2 SELECTION OF ENCLOSURES

- A. Indoor, Dry and Clean Locations: UL 50E, Type 1.
- B. Outdoor Locations: UL 50E, Type 3R.
- C. Other Wet or Damp, Indoor Locations: UL 50E, Type 4.

### 3.3 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
  - 1. 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.



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2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
3. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
4. Install fuses in fusible devices.

### 3.4 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.

### 3.5 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections for Switches:
  1. Visual and Mechanical Inspection:
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, grounding, and clearances.
    - c. Verify that unit is clean.
    - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
    - e. Verify that fuse sizes and types match the Specifications and Drawings.
    - f. Verify that each fuse has adequate mechanical support and contact integrity.
    - g. Inspect bolted electrical connections for high resistance using one of the following methods:
      - 1) Use low-resistance ohmmeter.
        - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
      - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
        - a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
    - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on Drawings.
    - i. Verify correct phase barrier installation.
    - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

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2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- c. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

3. Electrical Tests:

- a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- c. Perform contact/pole resistance test. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- d. Perform insulation resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values may be no less than 2 M  $\Omega$ .
- e. Determine the following by primary current injection:
  - 1) Long-time pickup and delay. Pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
  - 2) Short-time pickup and delay. Short-time pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
  - 3) Instantaneous pickup. Instantaneous pickup values must be as specified and within manufacturer's published tolerances.
- f. Test functionality of trip unit by means of primary current injection. Pickup values and trip characteristics must be as specified and within manufacturer's published tolerances.

4. Test and adjust controls, remote monitoring, and safeties.

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C. Nonconforming Work:

1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Collect, assemble, and submit test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List 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.

3.7 PROTECTION

- A. After installation, protect enclosed switches and circuit breakers from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

3.8 MAINTENANCE

- A. Infrared Scanning of Enclosed Switches and Breakers: Two months after Substantial Completion, perform infrared scan of joints and connections. Remove covers so joints and connections are accessible to portable scanner. Take visible light photographs at same locations and orientations as infrared scans for documentation to ensure follow-on scans match same conditions for valid comparison.
1. Instruments and Equipment: Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  2. Follow-up Infrared Scanning: Perform two follow-up infrared scans of enclosed switches and breakers, one at four months and another at 11 months after Substantial Completion.
  3. Instrument: Use infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide documentation of device calibration.
  4. Report: Prepare certified report that identifies units checked and that describes scanning results. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

END OF SECTION

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SECTION 265000 - LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luminaires and exit signs.
2. Luminaire fittings.
3. Lamps.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260523 "Control-Voltage Electrical Power Cables" specifies wiring connections installed by this Section.
3. Section 260529 "Hangers and Supports for Electrical Systems" specifies channel and angle supports installed by this Section.
4. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
5. Section 260923 "Lighting Control Devices" specifies automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors installed by this Section.

1.2 DEFINITIONS

- A. BUG Rating: Backlight, uplight, and glare rating for light pollution from exterior luminaires.
- B. CMH: Ceramic metal halide.
- C. Correlated Color Temperature (CCT): The absolute temperature (in kelvins) of a blackbody whose chromaticity (color quality) most nearly resembles that of the light source.
- D. Color Rendering Index (CRI): The measure of the degree of color shift objects undergo when illuminated by the light source as compared with the color of those same objects when illuminated by a reference light source. The lower the CRI of a light source, the more difficult it is to identify colors and stripes on electronic components and wiring.
- E. HPS: High-pressure sodium.

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### 1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
  - 1. For luminaires.
    - a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
      - 1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
    - b. Product Certificates: Include product certificates stating compliance with standards listed below, signed by manufacturer or fabricator.
      - 1) Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with current accreditation under National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
      - 2) Testing Agency Certified Data: For luminaires indicated on Lighting Fixture Schedule on Drawings, photometric data certified by qualified independent testing laboratory. Photometric data for remaining luminaires must be certified by manufacturer.
    - c. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
    - d. Include operating characteristics, electrical characteristics, and furnished accessories.
    - e. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
    - f. Include battery and charger data for emergency lighting units.
    - g. Include ballast factor.
    - h. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
    - i. Include photometric data and adjustment factors obtained from qualified laboratory tests.
  - 2. For luminaire fittings.
    - a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
      - 1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.

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- 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
  - 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.
- b. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - c. Include operating characteristics, electrical characteristics, and furnished accessories.
  - d. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
- 3. For lamps.
  - a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
    - 1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
    - 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
    - 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.
  - b. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - c. Include operating characteristics, electrical characteristics, and furnished accessories.
  - d. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
  - e. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
- C. Shop drawings.
- D. Field quality-control reports.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Manufacturers' published instructions.

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C. Field Reports:

1. Manufacturer's field reports for field quality-control support.
2. Manufacturer's field reports for system startup support.

1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Warranty documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect exposed surface finishes on lighting equipment by applying strippable, temporary protective covering before shipping.

1.7 WARRANTY FOR LUMINAIRES

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed luminaires perform in accordance with specified requirements and agrees to repair or replace products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.
  1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that luminaires perform in accordance with specified requirements and agrees to provide repair or replacement of products that fail to perform as specified within extended-warranty period.
  1. Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.

1.8 WARRANTY FOR BATTERIES

- A. Special Manufacturer Extended Warranty for Batteries: Manufacturer warrants that batteries perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within extended-warranty period.
  1. Initial Extended-Warranty Period for Li-ion Batteries: Three years from date of Substantial Completion; full coverage for materials only.
  2. Initial Extended-Warranty Period for Ni-Cd Batteries: Five years from date of Substantial Completion; full coverage for materials only.

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PART 2 - PRODUCTS

2.1 LUMINAIRES

A. Performance Criteria:

1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- b. See individual product types below for listing criteria.
- c. Marked in accordance with UL CCN HYXT, including UL 1598, for compatible power supply, installation location, and environmental conditions.

B. Source Quality Control:

- 1. Compile and submit product data.

C. Surface-Mounted Luminaire:

- 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. Albeo; brand of GE Current, a Daintree company; American Industrial Partners (AIP).
  - b. Alera Lighting; brand of GE Current, a Daintree company; American Industrial Partners (AIP).
  - c. Amerlux.
  - d. Architectural Area Lighting; brand of GE Current, a Daintree company; American Industrial Partners (AIP).
  - e. Atlas Lighting Products.
  - f. Columbia Lighting; brand of GE Current, a Daintree company; American Industrial Partners (AIP).
  - g. Cooper Lighting Solutions; Signify North America Corp.
  - h. Deco Lighting.
  - i. Digital Lumens.
  - j. E-conolight.
  - k. Edison Price Lighting.
  - l. Elite Lighting Corporation.
  - m. Focal Point; Legrand North America, LLC.
  - n. GE Current, a Daintree company; American Industrial Partners (AIP).
  - o. GE Lighting; a Savant Company.
  - p. H.E. Williams.
  - q. Howard Lighting Products.
  - r. Hubbell Lighting; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - s. Kim Lighting; brand of GE Current, a Daintree company; American Industrial Partners (AIP).
  - t. LMPG Inc.
  - u. Lighting Services, Inc.



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- v. Lightolier; brand of Signify North America Corp.
  - w. Lithonia Lighting; Acuity Brands Lighting, Inc.
  - x. Luraline Lighting.
  - y. OSRAM SYLVANIA.
  - z. Philips; Signify North America; Signify Holding.
2. Product Listing Criteria, LED: UL CCN IFAM; including UL 1598.
  3. Product Characteristics:
    - a. Openings: Doors, frames, and access panels must operate smoothly, not leak light under operating conditions, and permit relamping without use of tools or parts falling from enclosure.
    - b. Nominal Operating Voltage: 120 V(ac).
    - c. CRI: 80+.
    - d. Fixed lens.
    - e. Lens Thickness: Not less than 0.125 inch unless otherwise indicated.
      - 1) Visible variations in metal finishes are unacceptable in adjoining components.
    - f. LED Luminaires (UL CCN IFAM):
      - 1) Output Intensity: Not less than 750 lm.
      - 2) Efficacy: Not less than 80 lm/W.
      - 3) Rated Life: 35 000 hours to L70.
      - 4) CCT: 3500 K.
    - g. Emergency Ballast or Driver Location: Internal.

D. Recessed Luminaire:

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. Albeo; brand of GE Current, a Daintree company; American Industrial Partners (AIP).
  - b. Alera Lighting; brand of GE Current, a Daintree company; American Industrial Partners (AIP).
  - c. Amerlux.
  - d. Axis Lighting, Inc.
  - e. Columbia Lighting; brand of GE Current, a Daintree company; American Industrial Partners (AIP).
  - f. Cooper Lighting Solutions; Signify North America Corp.
  - g. Digital Lumens.
  - h. Edison Price Lighting.
  - i. Elite Lighting Corporation.
  - j. Focal Point; Legrand North America, LLC.
  - k. GE Current, a Daintree company; American Industrial Partners (AIP).
  - l. GE Lighting; a Savant Company.
  - m. LMPG Inc.
  - n. Lighting Services, Inc.

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- o. Lightolier; brand of Signify North America Corp.
  - p. Lithonia Lighting; Acuity Brands Lighting, Inc.
  - q. OSRAM SYLVANIA.
  - r. PureEdge Lighting.
  - s. RAB Lighting.
  - t. Selux Corporation.
  - u. Specialty Lighting Industries, Inc.
- 2. Product Listing Criteria, LED: UL CCN IFAO; including UL 1598
  - 3. Product Characteristics:
    - a. Ceiling Compatibility: NEMA LE 4.
    - b. Openings: Doors, frames, and access panels must operate smoothly, not leak light under operating conditions, and permit relamping without use of tools or parts falling from enclosure.
    - c. Nominal Operating Voltage: 120 V(ac).
    - d. Nominal Luminaire Operating Power Rating: Less than 20 W.
    - e. CRI: 80+.
    - f. LED Luminaires (UL CCN IFAO):
      - 1) Output Intensity: Not less than 750 lm.
      - 2) Efficacy: Not less than 75 lm/W.
      - 3) Rated Life: 35 000 hours to L70.
      - 4) CCT: 3500 K.
- E. UL FWBO - Exit Fixture:
- 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. Amerlux.
    - b. Cooper Lighting Solutions; Signify North America Corp.
    - c. Evenlite, Inc.
    - d. Hubbell Lighting; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - e. Lithonia Lighting; Acuity Brands Lighting, Inc.
    - f. Philips; Signify North America; Signify Holding.
  - 2. Source Limitations: Obtain products from single manufacturer.
  - 3. Product Listing Criteria: UL CCN FWBO; including UL 924, NFPA 101, and ICC IBC.
  - 4. Product Characteristics:
    - a. Nominal Operating Voltage: 120 V(ac).
    - b. Light Source: LED; 50,000 hours minimum rated life.
    - c. Legend Color: Red.
    - d. Internal emergency power unit.
    - e. Battery Type: Ni-Cd or Li-ion.

## 2.2 LUMINAIRE FITTINGS

- A. Performance Criteria:

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1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- b. See individual product types below for listing criteria.

B. Source Quality Control:

- 1. Compile and submit product data.

C. Luminaire Support Accessories:

1. Product Characteristics:

- a. Sized and rated for luminaire weight.
- b. Capable of maintaining luminaire position after cleaning and relamping.
- c. Capable of supporting luminaire without causing deflection of ceiling or wall.
- d. Capable of supporting horizontal force equal to 100 percent of luminaire weight and vertical force equal to 400 percent of luminaire weight.

2. Required Product Options:

- a. Hook Hangers: Integrated assembly matched to luminaire, supply voltage, and equipment with threaded attachment, cord, and locking-type plug.
- b. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage wire supports adjustable to 10 ft in length.
- c. Single-Stem Hangers: 1/2 inch nominal diameter steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- d. Rod Hangers: 3/16 inch nominal diameter, cadmium-plated, threaded steel rod.
- e. Aircraft Cables: 5/32 inch diameter cable supports, adjustable to 10 ft. in length.

## 2.3 LAMPS

A. Performance Criteria:

1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Source Quality Control:

- 1. Compile and submit product data.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Shop Drawings: Prepare and submit the following:
  - 1. Drawings, Diagrams, and Supporting Documents for Custom Luminaires:
    - a. Include plans, elevations, sections, and mounting and attachment details.
    - b. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    - c. Include diagrams for power, signal, and control wiring.
- B. Temporary Lighting: If approved by Architect, specified luminaires for Project may be installed for temporary lighting. Install and energize minimum quantity of luminaires necessary to meet needs of construction activities. When construction is sufficiently complete, remove, disassemble, clean, and relamp luminaires used for temporary lighting before reinstalling for Project delivery.

3.3 INSTALLATION OF LIGHTING

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
  - 1. Installation of Indoor Lighting Systems: NECA NEIS 500.
  - 2. Installation of Exterior Lighting Systems: NECA NEIS 501.
  - 3. Installation of Industrial Lighting Systems: NECA NEIS 502.
  - 4. Installation of Luminaires, Lampholders, and Lamps: Article 410 of NFPA 70.
  - 5. Installation of Extra-Low-Voltage Lighting: Article 411 of NFPA 70.
  - 6. Installation of Lighting for Sensitive Electronic Equipment: Article 647 of NFPA 70.
  - 7. Installation of Emergency Lighting and Exit Signs: ICC IBC, NFPA 101, and Parts IV and V in Article 700 of NFPA 70.
  - 8. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:

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1. Install luminaires level, plumb, and square with finished floor or grade unless otherwise indicated.
2. Install luminaires at height and aiming angle as indicated on Drawings.
3. Coordinate layout and installation of luminaires with other construction.
4. Adjust luminaires that require field adjustment or aiming.
5. Exterior Bollard Luminaires:
  - a. Align units for optimum directional alignment of light distribution.
6. Exterior Corrosion Prevention:
  - a. Do not use aluminum in contact with earth or concrete. When in direct contact with dissimilar metals, protect aluminum with insulating fittings or treatment.
  - b. When embedding steel conduits in concrete, wrap conduit with 10 mil thick, pipe-wrapping plastic tape applied with a 50 percent overlap.
7. Flush-Mounted Luminaire Support:
  - a. Secured to outlet box.
  - b. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
  - c. Trim ring flush with finished surface.
8. Wall-Mounted Luminaire Support:
  - a. Attached to structural members in walls.
  - b. Do not attach luminaires directly to gypsum board.
9. Suspended Luminaire Support:
  - a. Ceiling Mount:
    - 1) Hook hangers.
    - 2) Two wires.
    - 3) Two aircraft cables.
  - b. Pendants and Rods: Where longer than 48 inch, brace to limit swinging.
  - c. 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.
10. Emergency Power Units: Secure with approved fasteners in four or more locations, spaced near corners of unit.
11. Install wiring connections for luminaires.
12. Identification: Provide labels for luminaires and associated electrical equipment.
  - a. Identify field-installed conductors, interconnecting wiring, and components.
  - b. Provide warning signs.
  - c. Label each enclosure with engraved metal or laminated-plastic nameplate.

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- D. Systems Integration: Integrate lighting control devices and equipment with electrical power connections for operation of luminaires as specified.

### 3.4 FIELD QUALITY CONTROL OF LIGHTING

#### A. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
3. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
4. Verify operation of photoelectric controls.
5. Exterior Illumination Tests:
  - a. Measure light intensities at night. Use photometers with calibration referenced to NIST standards.

#### B. Nonconforming Work:

1. Luminaire will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

#### C. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

### 3.5 SYSTEM STARTUP

#### A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's published instructions.
2. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

### 3.6 ADJUSTING

#### A. Luminaire Aiming Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aiming direction 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 must be manufacturer's authorized replacement parts and supplies.
3. Adjust aim of luminaires in presence of Architect.

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3.7 PROTECTION

- A. After installation, protect lighting equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

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SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type OFR and Type CR communications raceways and fittings.
2. Cable supports and positioning devices.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" specifies firestopping for communications pathways installed by this Section.
2. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding conductors and connectors for communications pathways installed by this Section.
3. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers and supports for communications pathways installed by this Section.
4. Section 260533.13 "Conduits for Electrical Systems" specifies the following installed by this Section:
  - a. Type EMT-S duct raceways and elbows.
  - b. Type ERMCS duct raceways, elbows, couplings, and nipples.
  - c. Type FMC-S duct raceways.
  - d. Type LFMC duct raceways.
  - e. Fittings for conduit, tubing, and cable.
  - f. Electrically conductive corrosion-resistant compounds for threaded conduit.
  - g. Solvent cements.
5. Section 260533.16 "Boxes and Covers for Electrical Systems" specifies the following installed by this Section:
  - a. Metallic outlet boxes, device boxes, rings, and covers.
  - b. Nonmetallic outlet boxes, device boxes, rings, and covers.
  - c. Junction boxes and pull boxes.
  - d. Cover plates for device boxes.
  - e. Hoods for outlet boxes.
6. Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling" specifies sleeves and sleeve seals for communications pathways installed by this Section.
7. Section 260553 "Identification for Electrical Systems" specifies labels and warning signs for communications pathways installed by this Section.

1.2 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.



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B. Product Data:

1. For each type of product.

- a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
  - 1) If listed manufacturer differs from selling manufacture, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
  - 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
  - 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.

1.3 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Manufacturers' published instructions submittals.

PART 2 - PRODUCTS

2.1 TYPE OFR AND TYPE CR COMMUNICATIONS RACEWAYS AND FITTINGS

- A. Description: This product group covers raceways and fittings for installation of conductive and nonconductive optical-fiber cable, communications cable, power-limited fire-alarm cable, signaling cable, and coaxial cable in accordance with NFPA 70.
- B. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Optical-Fiber Cable Raceway: UL CCN QAZM; including UL 2024.
    - b. Communications Cable Raceway: UL CCN QBAA; including UL 2024.
- C. UL QAZM - Type OFR-GP General-Purpose Optical-Fiber Raceway:
  - 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:

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- a. 3M.
  - b. ADI.
  - c. Champion Fiberglass, Inc.
  - d. Corning Optical Communications; Corning Incorporated.
  - e. Dura-Line.
  - f. Eastern Wire & Conduit; Atkore.
  - g. Endot Industries Inc.
  - h. Ipex Electrical Inc.
  - i. Panduit Corp.
  - j. Petroflex North America.
  - k. Premier Conduit Inc.
  - l. Tii Technologies Inc.
- 2. Source Limitations: Obtain products from single manufacturer.
- 3. Product Characteristics:
  - a. Texture: Smooth.
  - b. Splicing: Fusion.
- D. UL QAZM - Type OFR-P Plenum Optical-Fiber Raceway:
  - 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. Atkore.
    - b. Belden Canada ULC.
    - c. Carlon; ABB, Electrification Business.
    - d. Corning Optical Communications; Corning Incorporated.
    - e. Gravenhurst Plastics Ltd.
    - f. Premier Conduit Inc.
  - 2. Source Limitations: Obtain products from single manufacturer.
  - 3. Product Characteristics:
    - a. Meets UL 2024 test requirements for "PLENUM" marking.
    - b. Texture: Smooth.
    - c. Splicing: Fusion.
- E. UL QAZM - Type OFR-R Riser Optical-Fiber Raceway:
  - 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. Belden Canada ULC.
    - b. Carlon; ABB, Electrification Business.
    - c. Corning Optical Communications; Corning Incorporated.
    - d. Dura-Line.
    - e. Homepath Products LLC.
    - f. Panduit Corp.
    - g. Premier Conduit Inc.

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2. Source Limitations: Obtain products from single manufacturer.
3. Product Characteristics:
  - a. Meets UL 2024 test requirements for "RISER" marking.
  - b. Texture: Smooth.
  - c. Splicing: Fusion.

F. UL QBAA - Type CR-GP General-Purpose Communications Cable Raceway:

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. CommScope, Inc.
  - b. Dura-Line.
  - c. Multilink Inc.
  - d. Ortronics, Inc.
  - e. Panduit Corp.
  - f. Premier Conduit Inc.
  - g. Telect, Inc.
  - h. Vericom Global Solutions.
2. Source Limitations: Obtain products from single manufacturer.
3. Product Characteristics:
  - a. Texture: Smooth.
  - b. Splicing: Fusion.

G. UL QBAA - Type CR-P Plenum Communications Cable Raceway:

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. America Fujikura Ltd. (AFL); Fujikura Ltd.
  - b. Atkore.
  - c. Belden Canada ULC.
  - d. Gravenhurst Plastics Ltd.
  - e. Premier Conduit Inc.
2. Source Limitations: Obtain products from single manufacturer.
3. Product Characteristics:
  - a. Meets UL 2024 test requirements for "PLENUM" marking.
  - b. Texture: Smooth.
  - c. Splicing: Fusion.

H. UL QBAA - Type CR-R Riser Communications Cable Raceway:

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:

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- a. America Fujikura Ltd. (AFL); Fujikura Ltd.
  - b. Belden Canada ULC.
  - c. Dura-Line.
  - d. Homepath Products LLC.
  - e. Panduit Corp.
  - f. Premier Conduit Inc.
2. Source Limitations: Obtain products from single manufacturer.
3. Product Characteristics:
  - a. Meets UL 2024 test requirements for "RISER" marking.
  - b. Texture: Smooth.
  - c. Splicing: Fusion.

## 2.2 CABLE SUPPORTS AND POSITIONING DEVICES

- A. Description: This category covers straps, hooks, and similar types of hardware for installation and use in communications cabling systems in accordance with NFPA 70 and manufacturer's installation instructions
- B. Performance Criteria:
  1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- C. UL DWMU - J-Hook or G-Hook Cable Support:
  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. ABB, Electrification Business.
    - b. ADI.
    - c. Cablofil; Legrand North America, LLC.
    - d. Elite Components Inc.; subsidiary of SIGMA Piping Products (SPP) LLC.
    - e. Panduit Corp.
    - f. Southwire Company, LLC.
  2. Source Limitations: Obtain products from single manufacturer.
  3. Product Listing Criteria: UL CCN DWMU; including UL 2239 or UL 1565.
  4. Product Characteristics:
    - a. Material: Galvanized steel.
- D. UL DWMU - Conduit or Cable Support Strap:
  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:

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- a. ABB, Electrification Business.
    - b. CADDY; brand of nVent Electrical plc.
    - c. Cooper B-line; brand of Eaton, Electrical Sector.
    - d. Hilti, Inc.
    - e. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - f. Southwire Company, LLC.
  2. Source Limitations: Obtain products from single manufacturer.
  3. Product Listing Criteria: UL CCN DWMU; including UL 2239 or UL 1565.
  4. Product Characteristics:
    - a. Mounting Orientation: Vertical or horizontal.
  5. Required Product Options:
    - a. Suitable for use in air handling space.
- E. UL ZODZ - Cable Tie or Management System:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. 3M Company, Electrical Markets Div (EMD).
    - b. ABB, Electrification Business.
    - c. Ace Hardware Corp.
    - d. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - e. Cambridge Resources.
    - f. Fastenal Co.
    - g. HellermannTyton.
    - h. Hilti, Inc.
    - i. Ideal Industries, Inc.
    - j. Mag Daddy.
    - k. NSi Industries LLC.
    - l. Panduit Corp.
    - m. Southwire Company, LLC.
    - n. TE Connectivity Ltd.
    - o. Velcro USA Inc.
  2. Source Limitations: Obtain products from single manufacturer.
  3. Product Listing Criteria: UL CCN ZODZ; including UL 62275.
  4. Product Characteristics:
    - a. Classification: Type 2 or 21.
    - b. Mechanical Strength: 80 N.
    - c. UL 746B Maximum Temperature Rating: 75 deg C.
    - d. Minimum Installation Temperature: Minus 15 deg C.
    - e. Fixing Device: Integral assembly.
  5. Required Product Options:
    - a. UL 2043 Air-Handling Spaces Rating: AH-1 metallic components.

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F. UL ZODZ - Cable Clamp, Clip, or Mount Positioning Device:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; Atkore International.
  - b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - c. CADDY; brand of nVent Electrical plc.
  - d. HellermannTyton.
  - e. Hilti, Inc.
  - f. Mag Daddy.
  - g. Panduit Corp.
  - h. Southwire Company, LLC.
2. Source Limitations: Obtain products from single manufacturer.
3. Product Listing Criteria: UL CCN ZODZ; including UL 1565.
4. Product Characteristics:
  - a. Materials: Metallic.
  - b. Mechanical Strength: 5 kg.
  - c. UL 746B Maximum Temperature Rating: 75 deg C.
5. Required Product Options:
  - a. Fixing Device: Magnetic fastener.
  - b. Resistant to ultraviolet light.
  - c. Resistant to corrosion.
  - d. UL 2043 Air-Handling Spaces Rating: AH-1 metallic components.

PART 3 - EXECUTION

3.1 SELECTION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.
- B. Type OFR and Type CR Communications Raceways: Comply with Table 800.154(b) of NFPA 70.
- C. Minimum Pathway Size:
  1. For Copper and Aluminum Cables: Metric designator 21 (trade size 3/4).
  2. For Optical-Fiber Cables: Metric designator 25 (trade size 1).
- D. Maximum Pathway Length Between Cable Access Points: 75 ft.
- E. Indoor Pathways:

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1. Hazardous Classified Locations: ERMIC.
  2. Exposed and Subject to Physical Damage: ERMIC and EMT. Locations include the following:
    - a. Locations less than 2.5 m (8 ft) above finished floor.
    - b. Stub-ups to above suspended ceilings.
  3. Exposed and Not Subject to Physical Damage: ERMIC, EMT.
  4. Concealed above Suspended Ceilings: ERMIC, EMT, OFR, CR, Cable tray, Hooks.
  5. Concealed in Ceilings and Interior Walls and Partitions: ERMIC, EMT, LFMC, OFR, CR.
  6. Damp or Wet Locations: ERMIC, LFMC.
  7. Supported by Solid Cable Tray: OFR, CR.
  8. Supported by Open Cable Tray: OFR-P, CR-P.
- F. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
1. ERMIC and IMC: Provide threaded-type fittings unless otherwise indicated.
- G. Surface Raceways: Where indicated on Drawings.
- H. Cable Supports and Positioning Devices:
1. Size hooks to allow minimum of 25 percent future capacity without exceeding design capacity limits.
  2. Support hooks directly from building structure. Do not use ceiling grid support rods or wires.
  3. Hook spacing must allow no more than 6 inch of slack. Lowest point of cables must be no closer than 6 inch to ceiling tiles, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
  4. Space hooks no more than 5 ft on center.
  5. Provide hook at each change in direction.
- I. Boxes and Enclosures:
1. Outdoors, Aboveground: UL 50E Type 3R.
  2. Indoors: UL 50E Type 1, except use Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.
- J. Identification of Underground Pathways, Handholes, and Structures:
1. Use "COMMUNICATIONS" for legend on warning planks, underground warning tape, and covers.
- 3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS
- A. Grounding and Bonding Conductors:
1. Communications Busbar Connections:

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- a. TBC: Not smaller than 1/0 AWG and no smaller than largest TBB.
  - b. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not larger than 750 kcmil, unless otherwise indicated on Drawings.
  - c. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated on Drawings.
  - d. TEBC: Not smaller than 2 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
  - e. UBC: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
  - f. Bonding Conductors to Structural Steel: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted clamp connectors.
2. Cable Tray Connections:
- a. Cable Tray Equipment Grounding Conductor: 8 AWG.
  - b. Cable Tray Bonding Jumper: If not supplied by cable manufacturer, provide bonding jumper not smaller than 10 AWG and not longer than 12 inch. If jumper is wire, it must be terminated with lug having two holes and long barrel for two crimps. If jumper is flexible braid, it must be terminated with one- or two-hole ferrule. Attach with bonding screw or connector provided by cable tray manufacturer.
3. Underground Connections: Not smaller than 2 AWG. Provide welded connectors, except bolted connectors may be used in handholes or manholes and as otherwise indicated on Drawings.

### 3.3 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

- A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:
- 1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
  - 2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.
- B. Pipe and Conduit Labeling: Comply with ASME A13.1 and IEEE C2.
- C. Color Coding Scheme for Communications Cable and Terminations: Comply with BICSI N1 and TIA-598.
- D. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
- 1. "COMMUNICATIONS."
  - 2. "FIRE ALARM."
  - 3. "SECURITY."
- E. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.



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- F. Locations of Underground Lines: Underground-line warning tape for communication, control wiring, and optical-fiber cable.
- G. Communications Vaults, Manholes, Handholes, and Pull and Junction Boxes: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels or self-adhesive wraparound labels to identify phase.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
- H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with 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 labels with conductor designation.
- J. Equipment Identification Labels:
  - 1. Black letters on white field.
  - 2. Indoor Equipment: Self-adhesive label, Baked-enamel signs, Metal-backed butyrate signs, Laminated acrylic or melamine plastic sign.
  - 3. Outdoor Equipment: Laminated acrylic or melamine sign, Stenciled legend 4 inch high.
  - 4. Equipment To Be Labeled:
    - a. Racks, Frames, and Enclosures: Identify front and rear of each enclosure with self-adhesive labels.
    - b. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
    - c. Communications cabinets.
    - d. Access doors and panels for concealed communications items.
    - e. Emergency system boxes and enclosures.
    - f. Contactors.
    - g. Remote-controlled switches, dimmer modules, and control devices.
    - h. Monitoring and control equipment.
    - i. Fire-alarm equipment.
    - j. Security equipment.
    - k. Life-safety communications equipment.
- K. Backbone Cables: Label each cable with a vinyl-wraparound label, self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.
- L. Horizontal Cables: Label each cable with a vinyl-wraparound label, self-adhesive wraparound label.
- M. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Identify cover plate in accordance with TIA-606.
- N. Cable Ties: General purpose, for attaching tags, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.

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2. In Spaces Handling Environmental Air: Plenum rated.

### 3.4 SELECTION OF SIGNS AND HAZARD MARKINGS

- A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.
- B. Signs, labels, and tags required for personnel safety must comply with the following standards:
  1. Safety Colors: NEMA Z535.1.
  2. Facility Safety Signs: NEMA Z535.2.
  3. Safety Symbols: NEMA Z535.3.
  4. Product Safety Signs and Labels: NEMA Z535.4.
  5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.
- C. Electrical Hazard Warnings:
  1. Multiple Power Sources Warning Legend: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT/RACK HAS MULTIPLE POWER SOURCES."
- D. Operating Instruction Signs: Self-adhesive labels, Baked-enamel warning signs, Metal-backed, butyrate warning signs, Laminated acrylic or melamine plastic signs.
- E. Emergency Operating Instruction Signs: Self-adhesive labels, Baked-enamel warning signs, Metal-backed, butyrate warning signs, Laminated acrylic or melamine plastic signs with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment.

### 3.5 INSTALLATION OF PATHWAYS FOR COMMUNICATIONS SYSTEMS

- A. Comply with manufacturers' published instructions, including limitations on distance, bends, and bend radius.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
  1. Type OFR Optical-Fiber Raceways: Article 800 of NFPA 70 and BICSI N1.
  2. Type CR Communications Raceways: Article 800 of NFPA 70 and BICSI N1.
  3. Cable Supports and Positioning Devices: Article 800 of NFPA 70 and BICSI N1.
  4. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
  1. Complete communications raceway installation before starting conductor installation.
  2. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.
  3. Provide hangers and supports for pathways, boxes, and enclosures.
  4. Firestop pathway penetrations of fire-rated assemblies.
  5. Identification:

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- a. Provide colors and labels for pathways, boxes, enclosures, and associated communications equipment as indicated on Drawings.
- b. Provide safety warning signs.

D. Interfaces with Other Work:

1. Coordinate installation of new communications pathways with existing conditions.
2. Grounding and Bonding: Bond metallic communications boxes and enclosures to metallic pathways. Coordinate with Section 271100 "Communications Equipment Room Fittings" for grounding and bonding of communications pathways to communications equipment room fittings.

3.6 PROTECTION

- A. Protect coatings and finishes of pathways, boxes, and enclosures 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

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SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Communications-circuit accessories.

B. Products Installed, but Not Furnished, under This Section:

1. Section 061000 "Rough Carpentry" furnishes equipment backing panels installed by this Section.
2. Section 260526 "Grounding and Bonding for Electrical Systems" furnishes the following installed by this Section:
  - a. Grounding and bonding conductors.
  - b. Grounding and bonding clamps.
  - c. Grounding and bonding bushings.
  - d. Grounding and bonding hubs.
  - e. Grounding and bonding connectors.
  - f. Intersystem bonding bridge grounding connector.
  - g. Grounding and bonding busbars.
3. Section 260529 "Hangers and Supports for Electrical Systems" furnishes hangers, supports, and concrete bases for communications equipment installed by this Section.
4. Section 260533.16 "Boxes and Covers for Electrical Systems" furnishes the following installed by this Section:
  - a. Metallic outlet boxes, device boxes, rings, and covers.
  - b. Junction boxes and pull boxes.
  - c. Cover plates for device boxes.
5. Section 260553 "Identification for Electrical Systems" furnishes labels and warning signs for communications pathways installed by this Section.

C. Related Requirements:

1. Section 270528 "Pathways for Communications Systems" for installation of cable pathways serving communications equipment room fittings installed under this Section.

1.2 DEFINITIONS

A. Abbreviations for Communications Spaces:

1. EF: Entrance facility; generally serves campus or building. EF may include an ER.
2. ER: Equipment room; generally serves campus or building.

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3. TE: Telecommunications enclosure; generally serves a single tenant or floor.
4. TR: Telecommunications room; generally serves a single tenant or floor.

B. Abbreviations for Communications Facilities:

1. HC: Horizontal cross-connect; also called "floor distributor" (FD).
2. IC: Intermediate cross-connect; also called "building distributor" (BD).
3. MC: Main cross-connect; also called "campus distributor" (CD).

C. Abbreviations for Grounding and Bonding:

1. BBC: Backbone bonding conductor, for connecting multiple TBBs serving the same floor.
2. PBB: Primary bonding busbar; located in main distribution frame room, ideally near electrical service entrance.
3. RBB: Rack bonding busbar; located in equipment cabinets and racks.
4. SBB: Secondary bonding busbar; located in intermediate distribution frame rooms.
5. TBB: Telecommunications bonding backbone, for connecting SBBs to PBB.
6. TBC: Telecommunications bonding conductor, for connecting PBB to intersystem bonding termination device or busbar at electrical service entrance.
7. TEBC: Telecommunications equipment bonding conductor, for connecting RBBs to SBBs or PBB.
8. UBC: Unit bonding conductor, for connecting individual communications equipment to RBBs or SBBs.

### 1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Shop Drawings:
  1. Communications equipment room drawings, diagrams, and supporting documents.

## PART 2 - PRODUCTS

### 2.1 COMMUNICATIONS-CIRCUIT ACCESSORIES

- A. Description: This category covers devices intended for connecting communications circuits in accordance with Article 800 of NFPA 70.
- B. Performance Criteria:
  1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  2. Listing Criteria:
    - a. For Communications Circuits: UL CCN DUXR; including UL 1863 and UL 467.

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- b. For Audio/Video, Data, and Signaling Circuits: UL CCN DUXR; including UL 1977 and UL 467.

C. UL DUXR - Patch Panel:

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. CommScope, Inc.
  - b. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - c. Legrand AV Inc.; Legrand North America, LLC.
  - d. Leviton Manufacturing Co., Inc.
  - e. Ortronics, Inc.
  - f. Panduit Corp.
  - g. Pass & Seymour; Legrand North America, LLC.
  - h. Siemon Co. (The).
2. Source Limitations: Obtain products from single manufacturer.
3. Product Characteristics:
  - a. Mounting: Equipment rack.
  - b. Style: Modular.
  - c. Configuration: Standard.
  - d. Include provisions for labeling ports.
4. Required Product Options:
  - a. Cable Type: Cat. 6.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Communications Equipment Room Drawings, Diagrams, and Supporting Documents:
  - a. Include plans, elevations, sections, details, and attachments to other work.
  - b. Equipment Racks and Cabinets: Indicate workspace requirements and access for cable connections.
  - c. Grounding and Bonding: Indicate location of busbars and their mounting details showing standoff insulators and wall mounting brackets.
  - d. Cable Trays, Large Raceways, Ducts, and Piping: Indicate elevation and route of vertical and horizontal cable trays, raceways or ducts larger than 2 inch wide, and fire-suppression piping located inside communications equipment room.
  - e. Luminaires: Indicate elevation, orientation, and size of luminaires inside the communications equipment room for coordination with cable trays, equipment racks, cabinets, and other equipment.

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- f. Access Panels: Indicate locations, dimensions, and clearances required to open access panels in ducts, walls, or ceilings inside communications equipment room.
  - g. Controls: Indicate locations of sensors, switches, and push-buttons for HVAC, fire suppression, fire alarm, and standby power.
  - h. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize configurations and space requirements of communications equipment.
  - i. Adjust configurations 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 equipment room.
  - j. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.
- B. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

### 3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR COMMUNICATIONS

#### A. Grounding and Bonding Conductors:

##### 1. Communications Busbar Connections:

- a. TBC: Not smaller than 1/0 AWG and no smaller than largest TBB.
- b. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not larger than 750 kcmil, unless otherwise indicated on Drawings.
- c. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated on Drawings.
- d. TEBC: Not smaller than 2 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
- e. UBC: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
- f. Bonding Conductors to Structural Steel: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted clamp connectors.

##### 2. Cable Tray Connections:

- a. Cable Tray Equipment Grounding Conductor: 8 AWG.
- b. Cable Tray Bonding Jumper: If not supplied by cable manufacturer, provide bonding jumper not smaller than 10 AWG and not longer than 12 inch. If jumper is wire, it must be terminated with lug having one hole and standard barrel for one crimp. If jumper is flexible braid, it must be terminated with one- or two-hole ferrule. Attach with bonding screw or connector provided by cable tray manufacturer.

#### B. Grounding and Bonding Busbars:

##### 1. PBB:

- a. Dimensions: 1/4 inch thick by 4 inch high.
- b. Stand-Off Distance: 2 inch.

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2. SBB:
  - a. Dimensions: 1/4 inch thick by 4 inch high.
  - b. Stand-Off Distance: 2 inch.

### 3.3 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

- A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:
  1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
  2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.
- B. Pipe and Conduit Labeling: Comply with ASME A13.1 and IEEE C2.
- C. Color Coding Scheme for Communications Cable and Terminations: Comply with BICSI N1 and TIA-598.
- D. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
  1. "COMMUNICATIONS."
  2. "FIRE ALARM."
  3. "SECURITY."
- E. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with conductor or cable designation, origin, and destination.
- G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes and self-adhesive labels with conductor designation.
- H. Equipment Identification Labels:
  1. Black letters on white field.
  2. Indoor Equipment: Self-adhesive label or baked-enamel signs or metal-backed butyrate signs.
  3. Equipment to Be Labeled:
    - a. Racks, Frames, and Enclosures: Identify front and rear of each enclosure with self-adhesive labels containing equipment designation.
    - b. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
    - c. Communications cabinets.
    - d. Access doors and panels for concealed communications items.
    - e. Emergency system boxes and enclosures.
    - f. Contactors.



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- g. Remote-controlled switches, dimmer modules, and control devices.
  - h. Monitoring and control equipment.
  - i. Fire-alarm equipment.
  - j. Security equipment.
  - k. Life-safety communications equipment.
- I. Backbone Cables: Label each cable with a vinyl-wraparound label or self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.
  - J. Horizontal Cables: Label each cable with a vinyl-wraparound label or self-adhesive wraparound label.
  - K. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Identify cover plate in accordance with TIA-606.

### 3.4 SELECTION OF SIGNS AND HAZARD MARKINGS

- A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.
- B. Signs, labels, and tags required for personnel safety must comply with the following standards:
  - 1. Safety Colors: NEMA Z535.1.
  - 2. Facility Safety Signs: NEMA Z535.2.
  - 3. Safety Symbols: NEMA Z535.3.
  - 4. Product Safety Signs and Labels: NEMA Z535.4.
  - 5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.
- C. Electrical Hazard Warnings:
  - 1. Multiple Power Sources Warning Legend: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT/RACK HAS MULTIPLE POWER SOURCES."
- D. Operating Instruction Signs: Self-adhesive labels or baked-enamel warning signs or metal-backed, butyrate warning signs or laminated acrylic or melamine plastic signs.
- E. Emergency Operating Instruction Signs: Self-adhesive labels or baked-enamel warning signs or metal-backed, butyrate warning signs or laminated acrylic or melamine plastic signs with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment.
- F. Label TBC, TBBs, and BBCs at attachment points with legend: "WARNING! COMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

### 3.5 FIELD-FABRICATION OF FITTINGS FOR EQUIPMENT ROOM

- A. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

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1. Designated Critical Operations Areas: Comply with Article 708 of NFPA 70.
2. Communications Systems: Comply with Ch. 8 of NFPA 70 and with BICSI N1.
3. Grounding and Bonding: Comply with Article 250 of NFPA 70 and with BICSI N3.
4. Consult Architect for resolution of conflicting requirements.

### 3.6 FIELD-FABRICATION OF FITTINGS FOR TELECOMMUNICATIONS ROOMS

- A. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Designated Critical Operations Areas: Comply with Article 708 of NFPA 70.
2. Communications Systems: Comply with Ch. 8 of NFPA 70 and with BICSI N1.
3. Grounding and Bonding: Comply with Article 250 of NFPA 70 and with BICSI N3.
4. Consult Architect for resolution of conflicting requirements.

### 3.7 INSTALLATION OF BONDING FOR COMMUNICATIONS

- A. Grounding of Communications: Bond PBB and SBBs to grounding electrode conductors at electrical power service entrance, and at electrical power derived systems serving communications equipment, using intersystem bonding termination device.

1. Structural Steel: Where structural steel of steel frame building is readily accessible within room or space, bond each SBB and PBB to vertical steel of building frame.

- B. Comply with manufacturer's published instructions.

- C. Reference Standards:

1. Bonding of Communications: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with BICSI N3.
2. Consult Architect for resolution of conflicting requirements.

- D. Special Techniques:

1. Bonding of Busbars:

- a. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 12 inch above finished floor unless otherwise indicated.
- b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.

2. Bonding Conductors:

- a. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
- b. Assemble wire connector to conductor, complying with manufacturer's published instructions and as follows:

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- 1) Use crimping tool and die specific to connector.
  - 2) Pretwist conductor.
  - 3) Apply antioxidant compound to bolted and compression connections.
- c. Install in straightest and shortest route between origination and termination point, and no longer than required. Bend radius must not be smaller than 10 times diameter of conductor. No single bend may exceed 90 degrees.
  - d. Install without splices.
  - e. Support conductors at not more than 36 inch intervals.
  - f. Outside telecommunications rooms, install conductors in metric designator 21 (trade size 3/4) PVC-80 conduit until conduit enters telecommunications room. Install bonding conductors in EMT-A or EMT-SS when routed through plenum. Do not install bonding conductors in EMT-S unless otherwise indicated on Drawings.
    - 1) If bonding conductor must be installed in EMT-S or other ferrous metallic raceway, bond conductor to raceway using grounding bushing and bond both ends of raceway to SBB.
3. Provide TBC and terminate ends to PBB and intersystem bonding termination device at electrical service entrance in accordance with Section 250.94, "Bonding for Communication Systems," of NFPA 70.
  4. Busbar Interconnections: Bond SBBs to PBB with TBBs. If more than one TBB is installed, bond TBBs together with BBCs where required by TIA-607.
  5. Communications Enclosures: Bond metallic enclosures of telecommunications equipment with UBCs to nearest SBB or PBB.
  6. Equipment Racks: Bond metallic components of enclosures to RBB using UBCs. Provide RBB if not provided by enclosure or rack manufacturer. Bond RBB to SBB with TEBC. Power connection must comply with NFPA 70; equipment grounding conductor in power cord of cord- and plug-connected equipment must be considered supplemental to bonding requirements in this Section.
  7. Shielded Cable: Bond shield of shielded cable to SBB in communications rooms and spaces. Comply with TIA-568.1 and TIA-568.2 when grounding shielded balanced twisted-pair cables.
  8. Primary Protector: Bond to PBB with insulated bonding conductor.
  9. Electrical Power Panelboards: Where electrical panelboards for communications equipment are located in same room or space, bond each ground bar of panelboard to SBB.
  10. Cable Trays: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
  11. Ladder Racks: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
  12. Access Floors: Bond metal parts of access floors to SBB.

### 3.8 FIELD QUALITY CONTROL FOR BONDING OF COMMUNICATIONS

#### A. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench according to manufacturer's published instructions.

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2. Test bonding connections of system using AC earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing PBB or SBB, using process recommended by BICSI N1. Conduct tests with facility in operation.
  - a. Measure resistance between PBB and electrical service intersystem termination point. Maximum acceptable value is 100 m $\Omega$ .
    - 1) If measured resistance from electrical service equipment to ground exceeds 5  $\Omega$ , notify Architect and include recommendations to reduce resistance to ground.
  - b. Measure resistance between SBBs and PBB. Maximum acceptable value is 100 m $\Omega$ .
3. Test for ground loop currents using digital clamp-on ammeter, with full scale not more than 10 A, displaying current in increments of 0.01 A at accuracy of plus or minus 2.0 percent.
  - a. With grounding infrastructure completed and communications system electronics operating, measure current in bonding conductors connected to PBB. Maximum acceptable AC current level is 1 A.

B. Nonconforming Work:

1. Communications bonding will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

C. Collect, assemble, and submit test and inspection reports.

### 3.9 PROTECTION

- A. After installation, protect communications equipment room fittings from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

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SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Category 6 twisted pair cable.
2. Twisted pair cable hardware.
3. Identification products.

1.2 DEFINITIONS

- A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- B. EMI: Electromagnetic interference.
- C. FTP: Shielded twisted pair.
- D. F/FTP: Overall foil screened cable with foil screened twisted pair.
- E. F/UTP: Overall foil screened cable with unscreened twisted pair.
- F. IDC: Insulation displacement connector.
- G. Jack: Also commonly called an "outlet," it is the fixed, female connector.
- H. LAN: Local area network.
- I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
- J. RCDD: Registered Communications Distribution Designer.
- K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- M. S/FTP: Overall braid screened cable with foil screened twisted pair.
- N. S/UTP: Overall braid screened cable with unscreened twisted pairs.
- O. UTP: Unscreened (unshielded) twisted pair.

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### 1.3 COPPER HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.
  - 1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
  - 2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
  - 3. Bridged taps and splices shall not be installed in the horizontal cabling.
- B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

### 1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
  - 1. Category 6 twisted pair cable.
  - 2. Twisted pair cable hardware.
  - 3. Identification products.
- C. Shop Drawings: Reviewed and stamped by RCDD.
  - 1. System Labeling Schedules:
    - a. Electronic copy of labeling schedules, in software and format selected by Owner.
    - b. Electronic copy of labeling schedules that are part of cabling and asset identification system of software.
  - 2. Cabling administration Drawings and printouts.
  - 3. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:
    - a. Telecommunications rooms plans and elevations.
    - b. Telecommunications pathways.
    - c. Telecommunications system access points.
    - d. Telecommunications grounding system.
    - e. Telecommunications conductor drop locations.
    - f. Typical telecommunications details.
    - g. Mechanical, electrical, and plumbing systems.

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- D. Twisted pair cable testing plan.
- E. Field quality-control reports.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For RCDD, installation supervisor, and field inspector.
- C. Product Certificates: For each type of product.
- D. Source quality-control reports.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For splices and connectors to include in maintenance manuals.
- C. Software and Firmware Operational Documentation:
  - 1. Software operating and upgrade manuals.
  - 2. Program Software Backup: On USB media or compact disk, complete with data files.
  - 3. Device address list.
  - 4. Printout of software application and graphic screens.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
  - 1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by an RCDD.
  - 2. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.
  - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
  - 1. Test each pair of twisted pair cable for open and short circuits.

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1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.
- B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
  - 1. Communications, Plenum Rated:
    - a. Type CMP complying with UL 1685.
    - b. Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
  - 2. Communications, Non-Plenum Rated:
    - a. Type CMR complying with UL 1666.
    - b. Type CMP or Type CMR in listed plenum or riser communications raceway.
    - c. Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- B. RoHS compliant.

2.3 CATEGORY 6 TWISTED PAIR CABLE

- A. Category 6 Twisted Pair Cable: Four-pair, balanced -twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250 MHz.
- 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. 3M.



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2. [AMP NETCONNECT; a TE Connectivity Ltd. company.](#)
  3. [Belden Inc.](#)
  4. [Berk-Tek, a Leviton Company.](#)
  5. [CommScope, Inc.](#)
  6. [General Cable; Prysmian Group North America.](#)
  7. [Genesis; Resideo Technologies, Inc.](#)
  8. [Hitachi Cable America Inc.](#)
  9. [Mohawk; a division of Belden Networking, Inc.](#)
  10. [Prysmian Cables and Systems; Prysmian Group North America.](#)
  11. [Superior Essex Inc.; subsidiary of LS Corp.](#)
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100-ohm, 23 AWG solid copper.
- E. Shielding/Screening: Unshielded twisted pairs (UTP).
- F. Cable Rating: Plenum.
- G. Jacket: Blue, green, orange, and purple thermoplastic.

## 2.4 TWISTED PAIR CABLE HARDWARE

- A. Twisted Pair Cable Hardware: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- 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. [3M.](#)
  2. [AMP NETCONNECT; a TE Connectivity Ltd. company.](#)
  3. [American Technology Systems Industries, Inc.](#)
  4. [Belden Inc.](#)
  5. [Berk-Tek, a Leviton Company.](#)
  6. [CommScope, Inc.](#)
  7. [Dynacom Corporation.](#)
  8. [General Cable; Prysmian Group North America.](#)
  9. [Genesis; Resideo Technologies, Inc.](#)
  10. [Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.](#)
  11. [Leviton Manufacturing Co., Inc.](#)
  12. [Mohawk; a division of Belden Networking, Inc.](#)
  13. [Molex Premise Networks.](#)
  14. [Panduit Corp.](#)
  15. [Prysmian Cables and Systems; Prysmian Group North America.](#)
  16. [Siemon Co. \(The\).](#)
  17. [Superior Essex Inc.; subsidiary of LS Corp.](#)
- C. General Requirements for Twisted Pair Cable Hardware:
1. Comply with the performance requirements of Category 6.

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2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
  3. Cables shall be terminated with connecting hardware of same category or higher.
- D. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.
- E. Connecting Blocks:
1. 110-style IDC for Category 6.
  2. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
- F. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
1. Number of Terminals per Field: One for each conductor in assigned cables.
- G. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
1. Features:
    - a. Universal T568A and T568B wiring labels.
    - b. Labeling areas adjacent to conductors.
    - c. Replaceable connectors.
    - d. 24 or 48 ports.
  2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
  3. Number of Jacks per Field: One for each four-pair.
- H. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with an eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
  2. Patch cords shall have color-coded boots for circuit identification.
- I. Plugs and Plug Assemblies:
1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
  2. Standard: Comply with TIA-568-C.2.
  3. Marked to indicate transmission performance.
- J. Jacks and Jack Assemblies:
1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
  2. Designed to snap-in to a patch panel or cover plate.
  3. Standard: Comply with TIA-568-C.2.
  4. Marked to indicate transmission performance.

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K. Cover Plate:

1. Four port, vertical single gang cover plates designed to mount to single gang wall boxes.
2. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
  - a. Flush mounting jacks, positioning the cord at a 45-degree angle.

L. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA-568-C.1.
- C. Factory test twisted pair cables according to TIA-568-C.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Routing:

1. Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters. Conceal raceway and cables, except in unfinished spaces.
  - a. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

- B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

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### 3.2 INSTALLATION OF PATHWAYS

- A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."
- B. Comply with Section 260529 "Hangers and Supports for Electrical Systems."
- C. Comply with Section 260536 "Cable Trays for Electrical Systems."

### 3.3 INSTALLATION OF TWISTED PAIR HORIZONTAL CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.
- B. General Requirements for Cabling:
  - 1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
  - 2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
  - 3. Install 110-style IDC termination hardware unless otherwise indicated.
  - 4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
  - 5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
  - 6. Consolidation points may be used only for making a direct connection to equipment outlets:
    - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    - b. Locate consolidation points for twisted pair cables at least 49 feet from communications equipment room.
  - 7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 8. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
  - 9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
  - 10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
  - 11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  - 12. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
  - 13. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

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C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

### 3.4 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with "Firestopping Systems" Article in BICSI's "Telecommunications Distribution Methods Manual."

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### 3.5 GROUNDING

- A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
- C. Comply with TIA-607-B and NECA/BICSI-607.

### 3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
  - 1. Administration Class: Class 2.
  - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- E. Cable and Wire Identification:
  - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
  - 3. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
    - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    - b. Label each unit and field within distribution racks and frames.
  - 4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

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- F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
  - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.
- G. Color Coding:
  - 1. Blue: Voice.
  - 2. Green: Data.
  - 3. Orange: Video.
  - 4. Purple: Access control.

### 3.7 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
  - 1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
  - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
  - 3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
    - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- D. Nonconforming Work:
  - 1. End-to-end cabling will be considered defective if it does not pass tests and inspections.
  - 2. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- E. Collect, assemble, and submit test and inspection reports.

END OF SECTION

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SECTION 281000 - ACCESS CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access control system.

- B. The Access Control / Security and DVM System must be an extension of the existing Honeywell Enterprise Building Integrator System with host server hardware located in Augusta, ME. The system is for monitoring and controlling, cameras, security, and access control. The control system must be seamlessly integrated with the State of Maine Building Control Center (BCC) which provides 24 hours a day, 7 days a week, 365 days a year monitoring of state facilities. Integration of PCSC IQ series panels, graphics, boards and front-end programming are proprietary to Honeywell International Inc.

C. Related Requirements:

1. Section 013100 "Project Management and Coordination" specifies preinstallation conference procedures.
2. Section 087111 "Door Hardware (Descriptive Specification)" specifies the following:
  - a. Electric strike(s).
  - b. Electromagnetic lock(s).
  - c. Delayed-egress electromagnetic lock(s).
  - d. Electromechanical lock(s).
  - e. Self-contained electronic lock(s).
  - f. Exit lock(s) and alarm(s).
  - g. Auxiliary electrified door hardware.
3. Section 087113 "Power Door Operators" specifies the following:
  - a. Door operator controls.
  - b. Panic exit device(s).
  - c. Electric strike(s).
  - d. Auxiliary electrified door hardware.
4. Section 281500 "Integrated Access Control Hardware Devices" specifies the following:
  - a. Swipe card reader(s).
  - b. Proximity reader(s) for card, fob, or smartphone.
  - c. Door lock keypad(s).
  - d. Scramble keypad(s).
  - e. Combination card reader(s) and keypad(s).
  - f. Access control cards.
  - g. Electrically controlled single-point latch(es).
  - h. Electrically controlled three-point latch(es).



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- i. Type 1 high-security electronic lock(s).
- j. Type 1F high-security combination lock(s).
- k. REX motion sensor(s).
- l. REX push-button(s).
- m. Magnetic lock hardware with special locking arrangement for fire-rated door(s).
- n. Panic hardware with special locking arrangement for fire-rated door(s).
- o. NFC access control device(s).
- p. Electronic key management system unit(s).

## 1.2 DEFINITIONS

- A. DGP: Data gathering panel.
- B. NFC: Near field communications.
- C. REX: Request-to-exit.

## 1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Shop Drawings:
  - 1. Project general notes.
  - 2. Head-end hardware, equipment, and device locations.
  - 3. Block diagram and cable/conduit routing illustrating end-to-end system wiring.
  - 4. End-to-end system communications details.
  - 5. Secondary power calculations
- C. Field quality-control reports.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Sample warranties.

## 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

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1. Installation and programming instructions for operating system software, including all applicable software add-ons.
2. Installation and programming instructions for antivirus and security protection software.
3. Manufacturer's recommended setup and testing procedure for operating system software and applicable software add-ons.
4. Troubleshooting instructions for operating system software and applicable software add-ons.
5. Manufacturer's recommended setup and testing procedure for antivirus and security protection software.
6. Troubleshooting instructions for antivirus and security protection software.
7. Installation instructions for access control system servers.
8. Installation instructions for access control system DGPs.
9. Installation instructions for access control system input/output interface.
10. Installation instructions for access control system door controllers.
11. Installation instructions for access control system workstation.
12. Installation instructions for access control system power supplies and battery chargers.
13. Installation instructions for access control system printers.
14. Manufacturer's recommended testing and inspection procedure for operation of access control system servers, panels, input/output interfaces, door controllers, and workstations.
15. Manufacturer's recommended testing and inspection procedure for operation of access control system power supplies and battery chargers.
16. Manufacturer's recommended testing and inspection procedure for operation of access control system printers.
17. Installation instructions for integrated credential readers and entry management devices.
18. Printing, programming, and handling instructions for access control credentials.
19. Installation instructions for electrified locking devices and accessories.
20. Installation instructions for egress management devices.
21. Installation instructions for access control remote devices.
22. Installation instructions for telephone entry systems.
23. Installation instructions for intercom entry systems.
24. Installation instructions for electronic key management systems.
25. Installation instructions for access control electronic turnstiles and mobility systems.
26. Manufacturer's recommended tests and inspections for integrated credential readers and entry management devices.
27. Manufacturer's recommended tests and inspections for electrified locking devices and accessories.
28. Manufacturer's recommended tests and inspections for egress management devices.
29. Manufacturer's recommended tests and inspections for access control remote devices.
30. Manufacturer's recommended tests and inspections for telephone entry systems.
31. Manufacturer's recommended tests and inspections for intercom entry systems.
32. Manufacturer's recommended tests and inspections for electronic key management systems.
33. Manufacturer's recommended tests and inspections for access control electronic turnstiles and mobility systems.
34. Manufacturer's recommended testing and inspection procedure for end-to-end operation of access control system software, hardware, and integrated hardware devices.

C. Warranty documentation.

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1.6 REGULATORY AGENCY APPROVALS

- A. Submittals for access control system requiring approval by authorities having jurisdiction must be signed and sealed by qualified life safety professional engineer responsible for their preparation.
- B. Submittals for access control system require action by Architect prior to submitting for approval by authorities having jurisdiction.

1.7 WARRANTY FOR ACCESS CONTROL SYSTEM

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed access control system performs in accordance with specified requirements and agrees to repair or replace components that fail to perform as specified within extended-warranty period.
  - 1. Extended-Warranty Period: Four years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that components of access control system perform in accordance with specified requirements and agrees to provide repair or replacement of components that fail to perform as specified within extended-warranty period.
  - 1. Initial Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.
  - 2. Follow-On Extended-Warranty Period: Eight years from date of Substantial Completion; full coverage for components only, free on board origin, freight prepaid.

1.8 WARRANTY FOR BATTERIES

- A. Special Manufacturer Extended Warranty for Batteries: Manufacturer warrants that batteries perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within warranted cycle life.
  - 1. Initial Extended-Warranty Period for Li-ion Batteries: Five years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.
  - 2. Follow-On Extended-Warranty Period for Li-ion Batteries: Ten years from date of Substantial Completion; prorated coverage for materials only, free on board origin, freight prepaid.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 INSTALLATION OF ACCESS CONTROL SYSTEM

- A. Description: Access control system provides a means of regulating or controlling physical entry into an area, or access to or use of a device by electrical, electronic, and/or mechanical means. Typical access control system includes a card reader at a controlled door, which reads a user credential and sends the collected data to a centrally located DGP over the cabling infrastructure. DGP may hold a user database onboard or may communicate with a user database over the network. If user is authorized for access at a controlled door, DGP signals the electronic lock at the door to unlock. If user credential is not authorized according to user database, the door remains locked and access is denied. In addition to card readers and electronic locks, access control systems may include various other connected devices programmed for a desired function.
- B. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. Components listed and labeled in accordance with NFPA 70 and NFPA 72, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
    - b. Comply with NFPA 1, NFPA 730, NFPA 731, and ICC IBC.
    - c. Certification: Provide certificate, authorized under UL Certification Service, that access control system installation complies with installation requirements of UL CCN ALOV.
  - 2. Listing Criteria: UL CCN ALOV and UL CCN ALVY; including UL 294.
  - 3. Consult Architect for resolution of conflicting requirements.
- C. Selection of Access Control System Components:
  - 1. Source Limitations: Obtain components for access control system from sources approved by manufacturer warranting performance of entire system.
  - 2. Provide the following specified products with the access control system:
    - a. Access Control Software and Database Management:
      - 1) Access control system unit operating system software.
      - 2) Access control system unit antivirus and security protection software.
      - 3) Visitor management database software.
      - 4) Mobile credential validation database software.
      - 5) Access control system supplementary computer equipment operating system software.
      - 6) Access control system supplementary computer equipment antivirus and security protection software.
      - 7) Credential card personalization software.
      - 8) Credential card printer and encoder software.

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b. Access Control System Hardware:

- 1) Quantity as indicated on Drawings of access control system door controller(s).
- 2) Quantity as indicated on Drawings of access control system input/output interface(s).

c. Security Door Hardware:

- 1) Quantity as indicated on Drawings of electric strike(s).
- 2) Quantity as indicated on Drawings of electromagnetic lock(s).
- 3) Quantity as indicated on Drawings of delayed-egress electromagnetic lock(s).
- 4) Quantity as indicated on Drawings of electromechanical lock(s).
- 5) Quantity as indicated on Drawings of self-contained electronic lock(s).
- 6) Quantity as indicated on Drawings of exit lock(s) and alarm(s).
- 7) Quantity as indicated on Drawings of auxiliary electrified door hardware.
- 8) Quantity as indicated on Drawings of door operator controls.
- 9) Quantity as indicated on Drawings of panic exit device(s) with electric strike.

d. Integrated Credential Readers and Entry Management:

- 1) Quantity as indicated on Drawings of swipe card reader(s).

e. Electrified Locking Devices and Accessories:

- 1) Quantity as indicated on Drawings of electrically controlled single-point latch(es).
- 2) Quantity as indicated on Drawings of electrically controlled two-point latch(es).
- 3) Quantity as indicated on Drawings of electrically controlled three-point latch(es).
- 4) Quantity as indicated on Drawings of Type 1 high-security electronic lock(s).
- 5) Quantity as indicated on Drawings of Type 1F high-security combination lock(s).
- 6) Quantity as indicated on Drawings of Type 2 high-security combination lock(s).
- 7) Quantity as indicated on Drawings of REX motion sensor(s).
- 8) Quantity as indicated on Drawings of REX push-button(s).

f. Egress Management Devices:

- 1) Quantity as indicated on Drawings of magnetic lock hardware with special locking arrangement.
- 2) Quantity as indicated on Drawings of panic hardware with special locking arrangement.

3. Operation:

- a. Exchange database information directly with DGPs.

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D. Special Techniques:

1. Comply with manufacturer's published instructions.
2. Mounting Heights: Mount field devices in accessible locations in accordance with United States Access Board ADA-ABA Accessibility Guidelines standards.
3. Wiring Methods:
  - a. Backbone Cable Type: Single-mode fiber or multi-mode fiber.
  - b. Cable Type: Shielded.
  - c. Analog Maximum Cable Length: 1000 ft.
  - d. Digital Maximum Cable Length: 300 ft.

E. Interfaces with Other Work:

1. Coordinate installation of new access control system components with existing conditions.
2. Coordinate with Section 087111 "Door Hardware (Descriptive Specification)" for interfacing access control system devices with door hardware.
3. Coordinate with Section 230923 "Direct Digital Control (DDC) System for HVAC" for interfacing access control system with temperature controls to turn HVAC system on and off.
4. Coordinate with Section 260923 "Lighting Control Devices" and Section 260943.23 "Relay-Based Lighting Controls" for interfacing access control system with lighting controls.
5. Coordinate with Section 284621.11 "Addressable Fire-Alarm Systems" for unlocking secured doors that are in exit ways, with or without delay.

F. Systems Integration:

1. Coordinate with Section 283100 "Intrusion Detection" for integrating access control system with intrusion detection system.
2. Coordinate with Section 282000 "Video Surveillance" for integrating access control system with video surveillance controls.

### 3.2 FIELD QUALITY CONTROL OF ACCESS CONTROL SYSTEM COMPONENTS

A. Field tests and inspections must be witnessed by Architect or Tenant or authorities having jurisdiction.

B. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections for access control system components.
2. Perform industry standard tests and inspections for power supplies, batteries, and other standby power provisions.
3. Engage factory-authorized service representative to test end-to-end system connection and functionality.
4. Verify monitoring of access control system status and diagnostics information.

C. Nonconforming Work:

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1. Access control equipment will be considered defective if it does not pass tests and inspections.
  2. Remove and replace defective units and retest.
- D. Collect, assemble, and submit test and inspection reports.
- E. Manufacturer Services:
1. Engage factory-authorized service representative to support field tests and inspections.

### 3.3 SYSTEM STARTUP

- A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks in accordance with manufacturer's published instructions.

### 3.4 ADJUSTING

- A. Control Sensor Adjustments: Adjust control devices to suit actual occupied conditions.
1. For proximity motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

### 3.5 PROTECTION

- A. After installation, protect access control system components from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

### 3.6 MAINTENANCE

- A. Control Sensor Readjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in readjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION

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SECTION 281400 - ACCESS CONTROL SYSTEM HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access control system units.
2. Access control system power supplies and battery chargers.

B. The Access Control / Security and DVM System must be an extension of the existing Honeywell Enterprise Building Integrator System with host server hardware located in Augusta, ME. The system is for monitoring and controlling, cameras, security, and access control. The control system must be seamlessly integrated with the State of Maine Building Control Center (BCC) which provides 24 hours a day, 7 days a week, 365 days a year monitoring of state facilities. Integration of PCSC IQ series panels, graphics, boards and front-end programming are proprietary to Honeywell International Inc.

C. Related Requirements:

1. Section 281500 "Integrated Access Control Hardware Devices" for access control field devices controlled by hardware specified in this Section.

1.2 DEFINITIONS

- A. DGP: Data gathering panel.
- B. LAN: Local area network.
- C. RAID: Redundant array of inexpensive disks; redundant array of independent disks.
- D. RAM: Random-access memory.
- E. WAN: Wide area network.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Coordination Meeting(s): For access control system hardware. Conduct meeting(s) as videoconference or at Project site before construction activity.
1. Attendees: Installers, representatives of manufacturers, representatives from telecommunications, IT representatives, and administrators for field tests and inspections. Notify Architect and Construction Manager of scheduled meeting dates.



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1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
  - 1. Access control system units.
  - 2. Access control system power supplies and battery chargers.
  - 3. Access control system supplementary computer equipment.
- C. Shop Drawings:
  - 1. Project general notes.
  - 2. Hardware and equipment locations.
  - 3. Block diagram and cable/conduit routing.
  - 4. System communications details.
  - 5. Hardware and equipment installation details.
- D. Field quality-control reports.

1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:
  - 1. Installation instructions for access control system input/output interface.
  - 2. Installation instructions for access control system door controllers.
  - 3. Manufacturer's recommended testing and inspection procedure for operation of access control system, panels, input/output interfaces, and door controllers.
  - 4. Installation instructions for access control system power supplies and battery chargers.
  - 5. Manufacturer's recommended testing and inspection procedure for operation of access control system power supplies and battery chargers.

1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Warranty documentation.

1.7 WARRANTY FOR ACCESS CONTROL SYSTEM HARDWARE

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed access control system hardware perform in accordance with specified requirements and agrees to repair

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or replace systems, assemblies, components, or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- B. Special Manufacturer Extended Warranty: Manufacturer warrants that access control system hardware perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.
1. Initial Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.

## 1.8 WARRANTY FOR BATTERIES

- A. Special Manufacturer Extended Warranty for Batteries: Manufacturer warrants that batteries perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within extended-warranty period.
1. Initial Extended-Warranty Period for Li-ion Batteries: Three years from date of Substantial Completion; full coverage for materials only, freight prepaid.
  2. Follow-On Extended-Warranty Period for Li-ion Batteries: Five years from date of Substantial Completion; prorated coverage for materials only, freight prepaid.
  3. Warranted Cycle Life for Flooded (Wet Cell or Open) Lead Acid Batteries: Equal to or greater than that represented in manufacturer's published table, but not less than the following, based on annual average battery temperature of 77 deg F and preventive maintenance performed in accordance with manufacturer's published instructions:
    - a. For discharge rate not faster than eight hours, discharge duration not longer than eight hours, and voltage at end of discharge not less than 1.75 V, warranted life must be not fewer than 40 discharge cycles.
    - b. For discharge rate not faster than one hour, discharge duration not longer than one hour, and voltage at end of discharge not less than 1.75 V, warranted life must be not fewer than 80 discharge cycles.
    - c. For discharge rate not faster than 15 minutes, discharge duration not longer than 45 seconds, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than 2700 discharge cycles.

## PART 2 - PRODUCTS

### 2.1 ACCESS CONTROL SYSTEM UNITS

- A. Description: This category covers head end units for access control systems, providing a means of regulating or controlling physical entry into an area, or access to or use of device by electrical, electronic, and/or mechanical means. Access control systems are investigated as complete configuration based upon manufacturer's specified system components. Access control systems are intended to comply with applicable life safety access and egress requirements.

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B. Performance Criteria:

1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70 and NFPA 72, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- b. Comply with NFPA 1, NFPA 730, NFPA 731, and ICC IBC.
- c. Firmware and Chip must be updated to accommodate the State of Maine Corp 1000 iClass SEOS Credentials and Hardware.

2. Listing Criteria: UL CCN ALVY; including UL 294.

C. Access Control System Door Controllers: PCSC IQ SERIES.

1. Source Limitations: Obtain products from single manufacturer.

2. Additional Characteristics:

- a. Data ports for connection to LAN and downstream controllers.
- b. Integral terminal blocks for connection of inputs/outputs to field devices.
- c. Controller Inputs:

- 1) Auxiliary input.
- 2) Door contact.
- 3) Cabinet tamper.
- 4) Power monitor.

d. Controller Outputs:

- 1) Auxiliary output.
- 2) Door strike.
- 3) Door operators.
- 4) Credential readers.

3. Options:

- a. Input Voltage: 12V (dc).
- b. Operating Temperature: 32 to 158 deg F.
- c. Controller Communication: Ethernet.
- d. Mounting: Cabinets must be mounted on 3/4-inch fire retardant plywood backboard painted with two coats of black latex paint.

## 2.2 ACCESS CONTROL SYSTEM POWER SUPPLIES AND BATTERY CHARGERS

A. Description: This category covers power supplies and battery chargers for access control system units, controllers, input/output interfaces, workstations, printers, and encoders.

B. Performance Criteria:

1. Regulatory Requirements:

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- a. Listed and labeled in accordance with NFPA 70 and NFPA 72, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - b. Comply with NFPA 1, NFPA 730, NFPA 731, and ICC IBC.
  - c. Class 2 Rated unless all cabling is installed in conduit.
- 2. Listing Criteria: UL CCN ALVY; including UL 294.
- C. Access Control System Power Supply and Battery Charger: Altronix AL1024ULACM.
  - 1. Source Limitations: Obtain products from single manufacturer.
  - 2. Additional Characteristics:
    - a. Input Voltage: 120V (ac).
    - b. Output Voltage: 12V (dc).
    - c. Operating Temperature: 32 to 120 deg F.
    - d. Network connection for remote supervision, management, and testing.
    - e. Enclosure lock with normally closed tamper switch and monitoring.
    - f. Built-in battery charger.
    - g. Minimum: 12V 7AH batteries.
  - 3. Options:
    - a. Number of Outputs: Four.
    - b. Mounting: Cabinet mount.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF ACCESS CONTROL SYSTEM HARDWARE

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
  - 1. Installation of Access Control System Hardware and Wiring: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with requirements in guide information for UL CCN ALVY.
  - 2. Consult Architect for resolution of conflicting requirements.

#### 3.2 FIELD QUALITY CONTROL OF ACCESS CONTROL SYSTEM HARDWARE

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
  - 1. Perform manufacturer's recommended tests and inspections.
- C. Nonconforming Work:

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1. Hardware and components will be considered defective if they do not pass tests and inspections.
  2. Remove and replace defective units and retest.
- D. Collect, assemble, and submit test and inspection reports.
- E. Manufacturer Services:
1. Engage factory-authorized service representative to supervise field tests and inspections.

3.3 SYSTEM STARTUP

- A. Engage a factory-authorized service representative to perform startup service.
1. Complete installation and startup checks in accordance with manufacturer's published instructions.

3.4 ADJUSTING

- A. Adjust printers and ribbons to function smoothly, and lubricate as recommended in writing by manufacturer.

3.5 PROTECTION

- A. After installation, protect access control system hardware from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

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SECTION 281500 - INTEGRATED ACCESS CONTROL HARDWARE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Integrated credential readers and entry management.
2. Electrified locking devices and accessories.

- B. The Access Control / Security and DVM System must be an extension of the existing Honeywell Enterprise Building Integrator System with host server hardware located in Augusta, ME. The system is for monitoring and controlling, cameras, security, and access control. The control system must be seamlessly integrated with the State of Maine Building Control Center (BCC) which provides 24 hours a day, 7 days a week, 365 days a year monitoring of state facilities. Integration of PCSC IQ series panels, graphics, boards and front-end programming are proprietary to Honeywell International Inc.

1.2 DEFINITIONS

- A. NFC: Near Field Communications.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Integrated Credential Readers and Entry Management:
  - a. Credential readers.
  - b. Keypads.
  - c. Combination reader devices.
2. Electrified Locking Devices and Accessories:
  - a. Electrically controlled single-point locks and latches.
  - b. Electrically controlled two- and three-point locks and latches.
  - c. High-security electronic locks.
  - d. Status monitoring and egress devices.
3. Egress Management Devices:
  - a. Panic hardware with special locking arrangement.
  - b. Fire-exit hardware with special locking arrangement.

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C. Shop Drawings:

1. Device layout.
2. Block diagram and cable/conduit routing.
3. System communications details.
4. System mounting details.

1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Manufacturers' Published Instructions: Record copy of official installation instructions issued to Installer by manufacturer for the following:
1. Installation instructions for integrated credential readers and entry management devices.
  2. Manufacturer's recommended tests and inspections for integrated credential readers and entry management devices.
  3. Installation instructions for electrified locking devices and accessories.
  4. Manufacturer's recommended tests and inspections for electrified locking devices and accessories.
  5. Installation instructions for egress management devices.
  6. Manufacturer's recommended tests and inspections for egress management devices.
- C. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Contracts:
1. Software and firmware service agreements.
- C. Warranty documentation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Extra Stock Material: Furnish to Owner extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Include the following:
1. Integrated Credential Readers and Entry Management Devices: One of each type.
  2. Electrified Locking Devices and Accessories: One of each type.

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1.7 REGULATORY AGENCY APPROVALS FOR EGRESS MANAGEMENT DEVICES

- A. Submittals for egress management devices requiring approval by authorities having jurisdiction must be signed and sealed by qualified life safety professional engineer responsible for their preparation.
- B. Submittals for egress management devices require action by Architect prior to submitting for approval by authorities having jurisdiction.

1.8 WARRANTY

A. Integrated Credential Readers and Entry Management Devices Warranty:

- 1. Special Installer Extended Warranty: Installer warrants that fabricated and installed integrated credential readers and entry management devices perform in accordance with specified requirements and agrees to repair or replace components that fail to perform as specified within extended-warranty period.
  - a. Extended-Warranty Period: Four years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- 2. Special Manufacturer Extended Warranty: Manufacturer warrants that integrated credential readers and entry management devices perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.
  - a. Initial Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.
  - b. Follow-On Extended-Warranty Period: Eight years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.

B. Electrified Locking Devices and Accessories Warranty:

- 1. Special Installer Extended Warranty: Installer warrants that fabricated and installed electrified locking devices and accessories perform in accordance with specified requirements and agrees to repair or replace components that fail to perform as specified within extended-warranty period.
  - a. Extended-Warranty Period: Four years from date of Substantial Completion; full coverage for labor, materials, and equipment.
- 2. Special Manufacturer Extended Warranty: Manufacturer warrants that electrified locking devices and accessories perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.
  - a. Initial Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for labor, materials, and equipment.
  - b. Follow-On Extended-Warranty Period: Eight years from date of Substantial Completion; full coverage for materials only, free on board origin, freight prepaid.



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PART 2 - PRODUCTS

2.1 INTEGRATED CREDENTIAL READERS AND ENTRY MANAGEMENT

A. Swipe Card Reader:

1. Provide HID Signo Priority Seos Profile Reader, Model 20, 20K, 40, 40k.

2.2 ELECTRIFIED LOCKING DEVICES AND ACCESSORIES

A. Electrically Controlled Single-Point Latch:

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. HES – Varies.
  - b. Folger-Adam – 310 Series.
  - c. Von Duprin – Varies.
2. Source Limitations: Obtain products from single manufacturer.
3. Performance Criteria:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - b. Listing Criteria:
    - 1) Special Locking Arrangements: UL CCN FWAX; including UL 294, NFPA 101, and ICC IBC.
    - 2) Electrically Controlled Single-Point Locks and Latches: UL CCN GYQS, UL 10B, and UL 10C; designed to be used with Class 2 control-voltage circuits in accordance with Article 725 of NFPA 70.
4. Options:
  - a. Audible and visual indication of door unlock.
  - b. Input Power: 24 V(ac/dc) PoE.
  - c. Operating Temperature: Minus 31 to plus 151 deg F.
  - d. Connectivity: Hardwired.
  - e. Materials: Zinc.
  - f. Finishes: US26D Satin Chrome.
  - g. Integrated Credential Reader:
    - 1) Proximity (125 kHz).
    - 2) Smart (13.56 MHz).
    - 3) Bluetooth, low energy (2.4 GHz).
    - 4) NFC.
  - h. Integrated keypad.
  - i. Failure Mode: Fail-secure.

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- j. Mechanical key override.
- k. Latch bolt monitor.
- l. With deadbolt.

B. Request-to-Exit (REX) Motion Sensor:

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. BOSCH – Detection Systems DS150i or DS151i.
  - b. Honeywell – Intelligence IS310WH or IS310BL.
2. Source Limitations: Obtain products from single manufacturer.
3. Performance Criteria:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - b. Listing Criteria: UL CCN ALVY; including UL 294.
4. Options:
  - a. Input Power: 12V (dc).
  - b. Operating Temperature: Minus 13 to plus 140 deg F.
  - c. Sensing Technology: Passive infrared (PIR).
  - d. Color: White.
  - e. Mounting: Door frame.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
  1. Cable Type: Shielded.
  2. Analog Maximum Cable Length: 1000 ft.
  3. Digital Maximum Cable Length: 300 ft.
- C. Interfaces with Other Work:
  1. Egress Management Interfaces:
    - a. Coordinate with Section 282000 "Video Surveillance" for automatic video feed callup upon delayed egress activation.

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3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Perform manufacturer's recommended tests and inspections.
- B. Nonconforming Work:
  - 1. Device will be considered defective if it does not pass tests and inspections.
  - 2. Remove and replace defective units and retest.
- C. Collect, assemble, and submit test and inspection reports.
- D. Manufacturer Services:
  - 1. Engage factory-authorized service representative to supervise field tests and inspections.

3.3 PROTECTION

- A. After installation, protect integrated access control hardware devices from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

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SECTION 282000 - VIDEO SURVEILLANCE

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 video surveillance system consisting of cameras, digital video recorder, data transmission wiring, and a control station with its associated equipment.
- B. The Access Control / Security and DVM System must be an extension of the existing Honeywell Enterprise Building Integrator System with host server hardware located in Augusta, ME. The system is for monitoring and controlling, cameras, security, and access control. The control system must be seamlessly integrated with the State of Maine Building Control Center (BCC) which provides 24 hours a day, 7 days a week, 365 days a year monitoring of state facilities. Integration of PCSC IQ series panels, graphics, boards and front-end programming are proprietary to Honeywell International Inc.

1.3 DEFINITIONS

- A. AGC: Automatic gain control.
- B. BNC: Bayonet Neill-Concelman - type of connector.
- C. B/W: Black and white.
- D. CCD: Charge-coupled device.
- E. FTP: File transfer protocol.
- F. IP: Internet protocol.
- G. LAN: Local area network.
- H. MPEG: Moving picture experts group.
- I. NTSC: National Television System Committee.
- J. PC: Personal computer.
- K. PTZ: Pan-tilt-zoom.
- L. RAID: Redundant array of independent disks.

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- M. TCP: Transmission control protocol - connects hosts on the Internet.
- N. UPS: Uninterruptible power supply.
- O. WAN: Wide area network.

#### 1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- C. Shop Drawings: For video surveillance. 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. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
  - 3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
  - 4. UPS: Sizing calculations.
  - 5. Wiring Diagrams: For power, signal, and control wiring.
- D. Design Data: Include an equipment list consisting of every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Field quality-control reports.
- C. Product Warranty: Sample of special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to

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include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

## 1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use NEMA 250, Type 3R enclosures.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment 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 SYSTEM REQUIREMENTS

- A. Video-signal format shall comply with NTSC standard, composite interlaced video. Composite video-signal termination shall be 75 ohms.
- B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.
  1. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

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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."
- 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 NECA 1.
- D. Comply with NFPA 70.
- E. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

## 2.3 CAMERAS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  1. Axis Communications.
- B. Cameras:
  1. Fixed Interior Model P3265 – V or better.
  2. Fixed Exterior Model P3265 – LVE or better.
  3. PTZ Model P5654 – E or better.
  4. Multi View – Axis P3727 – PLE.
  5. Panoramic – Axis P3807 – PVE.

## 2.4 POWER SUPPLIES

- A. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, and of type as recommended by manufacturer of camera, infrared illuminator, and lens.
  1. Enclosure: NEMA 250, Type 1.

## 2.5 CAMERA-SUPPORTING EQUIPMENT

- 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. Bosch Security Systems, Inc.
  2. CBC (AMERICA) Corp.
  3. COP-USA.
  4. Crest Electronics, Inc.
  5. ELMO.
  6. Elbex Ltd.
  7. EverFocus Electronics Corporation.
  8. Honeywell Commercial Security; Honeywell International, Inc.

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9. [Ikegami Electronics \(USA\) Inc.](#)
  10. [Interlogix; Carrier Global Corporation.](#)
  11. [Merit Li-Lin \(USA\) Corp.](#)
  12. [Moog, Inc.](#)
  13. [Panasonic Corporation of North America.](#)
  14. [Pelco.](#)
  15. [SANYO North America Corporation.](#)
  16. [Samsung Opto-Electronics.](#)
  17. [Telpix Electronics, Inc.](#)
  18. [Tyco Security Products; brand of Johnson Controls International plc, Building Solutions North America.](#)
  19. [Vicon Industries, Inc.](#)
  20. [Video Mount Products.](#)
  21. [Visiontech.](#)
  22. [Wren Associates Limited.](#)
- B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.
- C. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.
- D. Protective Housings for Fixed and Movable Cameras: Steel enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.
1. Camera Viewing Window: Polycarbonate window, aligned with camera lens.
  2. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.
  3. Built-in, thermostat-activated heater units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.
  4. Sun shield shall not interfere with normal airflow around the housing.
  5. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be stainless steel.
  6. Finish: Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the environment.
  7. Enclosure Rating: NEMA 3R.

## 2.6 MONITORS

- 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. [Bosch Security Systems, Inc.](#)
  2. [CBC \(AMERICA\) Corp.](#)
  3. [COP-USA.](#)
  4. [Crest Electronics, Inc.](#)
  5. [ELMO.](#)
  6. [Elbex Ltd.](#)
  7. [EverFocus Electronics Corporation.](#)
  8. [Hitachi Cable America Inc.](#)



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9. [Honeywell Commercial Security; Honeywell International, Inc.](#)
10. [Hunt Electronics USA, Inc.](#)
11. [Ikegami Electronics \(USA\) Inc.](#)
12. [Interlogix; Carrier Global Corporation.](#)
13. [International Space Optics.](#)
14. [JVC Americas Corp.](#)
15. [Merit Li-Lin \(USA\) Corp.](#)
16. [Panasonic Corporation of North America.](#)
17. [Pelco.](#)
18. [SANYO North America Corporation.](#)
19. [Samsung Opto-Electronics.](#)
20. [Tatung Company of America, Inc.](#)
21. [Telpix Electronics, Inc.](#)
22. [Toshiba International Corporation.](#)
23. [Trinus Systems Inc.](#)
24. [Tyco Security Products; brand of Johnson Controls International plc, Building Solutions North America.](#)
25. [Vicon Industries, Inc.](#)

B. Color:

1. Metal cabinet units designed for continuous operation.
2. Screen Size (Diagonal Dimension): 24 inches minimum.
3. Horizontal Resolution: 300 lines.
4. Minimum Front Panel Devices and Controls: Power switch; power-on indicator; and brightness, contrast, color, and tint controls.
5. Degaussing: Automatic.
6. Mounting: Dual, 9-inch, vertical, EIA 19-inch electronic equipment rack or cabinet complying with CEA 310-E.
7. Electrical: 120-V ac, 60 Hz.

## 2.7 IP VIDEO SYSTEMS

- A. The System shall be an extension of the existing Honeywell Enterprise Building Integrator System with host server hardware located in Augusta, ME.
- B. Cameras must connect to the LAN and terminate in the Honeywell Digital Video Manager.
- C. Provide CAT6 cable. Terminate with RJ45 jack using EIA/TIA568B standard.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.
- B. Examine roughing-in for LAN, WAN, and IP network before device installation.

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- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 WIRING

- A. Wiring Method: Install cables in raceways unless otherwise indicated.
  - 1. Except raceways are not required in accessible indoor ceiling spaces and attics.
  - 2. Except raceways are not required in hollow gypsum board partitions.
  - 3. Conceal raceways and wiring except in unfinished spaces.
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- C. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- D. For communication wiring, comply with the following:
  - 1. Section 271513 "Communications Copper Horizontal Cabling."
    - a. CAT 6 or better network wiring.
- E. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

### 3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

- A. Install cameras and infrared illuminators level and plumb.
- B. Install cameras with 84-inch-minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.
- C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.
- D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.
- E. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.
- F. Avoid ground loops by making ground connections only at the control station.
  - 1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

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### 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.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
  - 1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
  - 2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
    - a. Prepare equipment list described in "Informational Submittals" Article.
    - b. Verify operation of auto-iris lenses.
    - c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
    - d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
    - e. Set and name all preset positions; consult Owner's personnel.
    - f. Set sensitivity of motion detection.
    - g. Connect and verify responses to alarms.
    - h. Verify operation of control-station equipment.
  - 3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
  - 4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
- D. Video surveillance system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

### 3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to

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two visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.6 CLEANING

- A. Clean installed items using methods and materials recommended in writing by manufacturer.
- B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION

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SECTION 283100 - INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sensing devices.

- B. The Access Control / Security and DVM System must be an extension of the existing Honeywell Enterprise Building Integrator System with host server hardware located in Augusta, ME. The system is for monitoring and controlling, cameras, security, and access control. The control system must be seamlessly integrated with the State of Maine Building Control Center (BCC) which provides 24 hours a day, 7 days a week, 365 days a year monitoring of state facilities. Integration of PCSC IQ series panels, graphics, boards and front-end programming are proprietary to Honeywell International Inc.

C. Related Sections:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
2. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260523 "Control-Voltage Electrical Power Cables for power cabling between master control units and field-mounted devices and control units.
3. Section 271513 "Communications Copper Horizontal Cabling" for Category 5e, 6, and 7 horizontal (general use, riser-, and plenum-rated) cabling.

1.2 DEFINITIONS

- A. CCTV: Closed-circuit television.
- B. PIR: Passive infrared.
- C. RFI: Radio-frequency interference.
- D. UPS: Uninterruptible power supply.
- E. Control Unit: System component that monitors inputs and controls outputs through various circuits.
- F. Master Control Unit: System component that accepts inputs from other control units and may also perform control-unit functions. The unit has limited capacity for the number of protected zones and is installed at an unattended location or at a location where it is not the attendant's primary function to monitor the security system.
- G. Monitoring Station: Facility that receives signals and has personnel in attendance at all times to

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respond to signals. A central station is a monitoring station that is listed.

- H. Protected Zone: A protected premises or an area within a protected premises that is provided with means to prevent an unwanted event.
- I. Standard Intruder: A person who weighs 100 lb or less and whose height is 60 inch or less; dressed in a long-sleeved shirt, slacks, and shoes.
- J. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of a "standard intruder" in a protected zone.
- K. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.
- L. Zone. A defined area within a protected premises. It is a space or area for which an intrusion must be detected and uniquely identified. The sensor or group of sensors must then be assigned to perform the detection, and any interface equipment between sensors and communication must link to master control unit.

### 1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
  - 1. For each type of product.
    - a. Include manufacturer's sample extended warranty language.
- C. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
  - 1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify programmable logic controllers, networks, and control interface devices and media to be used. Describe characteristics of network and other data communication lines.
    - a. Indicate methods used to achieve systems integration.
    - b. Indicate control, signal, and data communication paths and identify PLCs, networks, control interface devices, and media to be used.
    - c. Describe characteristics of network and other data communication lines.
    - d. Describe methods used to protect against power outages and transient voltages including types and ratings of isolation and surge suppression devices used in data, communication, signal, control, and ac and dc power circuits.
  - 2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection and for systems integration. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.

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3. UPS: Sizing calculations.
  4. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building. Include room layout for master control-unit console, terminal cabinet, racks, and UPS.
  5. Master Control-Unit Console Layout: Show required artwork and device identification.
  6. Device Address List: Coordinate with final system programming.
  7. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
  8. Details of surge-protection devices and their installation.
  9. Sensor detection patterns and adjustment ranges.
- D. Design Data: Include method of operation and supervision of each component and each type of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are unacceptable.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: In addition to qualification data specified in Section 260010 "Supplemental Requirements for Electrical" submit qualification data for Installer and intrusion detection systems integrator.
- C. Manufacturer's published instructions.
- D. Field Reports:
  1. Manufacturer's field reports for field quality-control support.
  2. Field Test Plans: Test plan and report defining all tests required to ensure that system meets technical, operational, and performance specifications within 60 days of date of Contract award.
  3. Evaluation Reports: Examination reports documenting inspections of substrates, areas, and conditions.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For intrusion detection system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
  1. Data for each type of product, including features and operating sequences, both automatic and manual.
  2. Master control-unit hardware and software data.

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## 1.6 QUALIFICATIONS

- A. Security Design Professional: Design professional with active Physical Security Professional (PSP) certification issued by American Society for Industrial Security (ASIS International) and with documented experience managing installation of security systems in similar size and complexity.
- B. Security Testing and Inspecting Agency: Entity possessing active credentials from qualified electrical testing laboratory recognized by authorities having jurisdiction.
  - 1. On-site security testing supervisor must have ASIS certification and documented training and experience with testing security equipment in accordance with ASIS testing standards.
- C. Intrusion Detection Systems Installer:
  - 1. An employer of workers, at least one of whom is a Certified Alarm Technician, Level 1.
  - 2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
  - 3. Layout Responsibility: Preparation of Shop Drawings and cabling administration Drawings by an RCDD.
- D. Intrusion Detection Systems Integrator: An experienced intrusion detection equipment supplier who has completed systems integration work for installations similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
  - 1. At least one of whom is a Certified Systems Integrator.

## 1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Capable of withstanding the requirements specified in Section 018116 "Facility Environmental Requirements" and the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
  - 1. Altitude: Sea level to 4000 ft.
  - 2. Master Control Unit: Rated for continuous operation in an ambient of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
  - 3. Interior, Controlled Environment: System components, except master control unit, installed in air-conditioned or temperature-controlled interior environments must be rated for continuous operation in ambients of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.
  - 4. Interior, Uncontrolled Environment: System components installed in non-air-conditioned or non-temperature-controlled interior environments must be rated for continuous operation in ambients of 0 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.
  - 5. Exterior Environment: System components installed in locations exposed to weather must be rated for continuous operation in ambients of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Comply with UL 294 and UL 639 for outdoor-use equipment. Rate for continuous operation when exposed to rain as specified in UL 50E, winds up to 85 mph.



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1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. System Description: Hardwired, modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.

1. Supervision: System components must be continuously monitored for normal, alarm, supervisory, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.
  - a. Alarm Signal: Display at master control unit and actuate audible and visual alarm devices.
  - b. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal must indicate system problems such as battery failure, open or shorted transmission line conductors, or control-unit failure.
  - c. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the particular device or control unit.
2. System Control:
  - a. Master control unit must directly monitor intrusion detection units and connecting wiring.
3. System must automatically reboot program without error or loss of status or alarm data after any system disturbance.
4. Operator Commands:
  - a. Help with System Operation: Display all commands available to operator. Help command, followed by a specific command, must produce a short explanation of the purpose, use, and system reaction to that command.
  - b. Acknowledge Alarm: To indicate that alarm message has been observed by operator.
  - c. Place Protected Zone in Access: Disable all intrusion-alarm circuits of a specific protected zone. Tamper circuits may not be disabled by operator.
  - d. Place Protected Zone in Secure: Activate all intrusion-alarm circuits of a protected zone.
  - e. Protected Zone Test: Initiate operational test of a specific protected zone.
  - f. System Test: Initiate system-wide operational test.
  - g. Print reports.

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5. Timed Control at Master Control Unit: Allow automatically timed "secure" and "access" functions of selected protected zones.
  6. Automatic Control of Related Systems: Alarm or supervisory signals from certain intrusion detection devices control the following functions in related systems:
    - a. Switch selected lights.
    - b. Shift elevator control to a different mode.
    - c. Open a signal path between certain intercommunication stations.
    - d. Shift sound system to "listening mode" and open a signal path to certain system speakers.
    - e. Switch signal to selected monitor from CCTV camera in vicinity of sensor signaling an alarm.
  7. Printed Record of Events: Print a record of alarm, supervisory, and trouble events on system printer. Sort and report by protected zone, device, and function. When master control unit receives a signal, print a report of alarm, supervisory, or trouble condition. Report type of signal (alarm, supervisory, or trouble), protected zone description, date, and time of occurrence. Differentiate alarm signals from other indications. When system is reset, report reset event with the same information concerning device, location, date, and time. Commands must initiate the reporting of a list of current alarm, supervisory, and trouble conditions in system or a log of past events.
  8. Response Time: Two seconds between actuation of any alarm and its indication at master control unit.
  9. Circuit Supervision: Supervise all signal and data transmission lines, links with other systems, and sensors from master control unit. Indicate circuit and detection device faults with both protected zone and trouble signals, sound a distinctive audible tone, and illuminate an LED. Maximum permissible elapsed time between occurrence of a trouble condition and indication at master control unit is 20 seconds. Initiate an alarm in response to opening, closing, shorting, or grounding of a signal or data transmission line.
  10. Programmed Secure-Access Control: System must be programmable to automatically change status of various combinations of protected zones between secure and access conditions at scheduled times. Status changes may be preset for repetitive, daily, and weekly; specially scheduled operations may be preset up to a year in advance. Manual secure-access control stations must override programmed settings.
  11. Manual Secure-Access Control: Coded entries at manual stations must change status of associated protected zone between secure and access conditions.
- B. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- C. Compatibility: Detection devices and their communication features, connecting wiring, and master control unit must be selected and configured with accessories for full compatibility with the following equipment:
1. Door hardware specified in Section 087100 "Door Hardware."
  2. Lighting controls specified in Section 260923 "Lighting Control Devices."
  3. Lighting controls specified in Section 260943.23 "Relay-Based Lighting Controls."
  4. Video surveillance system specified in Section 282000 "Video Surveillance."

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- D. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.
  - 1. Minimum Protection for Power Lines 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
  - 2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Listed and labeled by a qualified testing agency for compliance with NFPA 731.
- E. Interference Protection: Components must be unaffected by radiated RFI and electrical induction of 15 V/m over a frequency range of 10 to 10 000 MHz and conducted interference signals up to 0.25 V(rms) injected into power supply lines at 10 to 10 000 MHz.
- F. Tamper Protection: Tamper switches on detection devices, control units, annunciators, pull boxes, junction boxes, cabinets, and other system components must initiate a tamper-alarm signal when unit is opened or partially disassembled and when entering conductors are cut or disconnected. Master control-unit alarm display must identify tamper alarms and indicate locations.
- G. Self-Testing Devices: Automatically test themselves periodically, but not less than once per hour, to verify normal device functioning and alarm initiation capability. Devices transmit test failure to master control unit.
- H. Antimasking Devices: Automatically check operation continuously or at intervals of a minute or less, and use signal-processing logic to detect blocking, masking, jamming, tampering, or other operational dysfunction. Devices transmit detection of operational dysfunction to master control unit as an alarm signal.
- I. Addressable Devices: Transmitter and receivers must communicate unique device identification and status reports to master control unit.
- J. Enclosures:
  - 1. Interior Sensors: Enclosures that protect against dust, falling dirt, and dripping noncorrosive liquids.
  - 2. Interior Electronics: UL 50E, Type 12.
  - 3. Screw Covers: Where enclosures are readily accessible, secure with security fasteners of type appropriate for enclosure.

## 2.2 SENSING DEVICES

- A. Flush-Mounted Door or Window Switch :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Interlogix; Carrier Global Corporation.

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2. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
  - a. Interlogix – 1078c.
  - b. Interlogix – 1085T.
  - c. Interlogix – 1045T.
3. Listing Criteria:
  - a. Listed and labeled by a qualified electrical testing agency for compliance with UL 639.
  - b. Listed and labeled by a qualified electrical testing agency for compliance with SIA CP-01.
  - c. FM Global Compliance: FM Approved and labeled perimeter security devices and equipment.
4. Standard Features:
  - a. Balanced-magnetic switch, complying with UL 634, installed on frame with integral overcurrent device to limit current to 80 percent of switch capacity.
  - b. Bias magnet and minimum of two or three encapsulated reed switches must resist compromise from introduction of foreign magnetic fields.
  - c. Unobtrusive and flush with surface of door or window frame.
  - d. Remote Test: Simulate movement of actuating magnet from master control unit.

B. Duress-Alarm Switch :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Ademco.
2. Basis-of-Design Product: Subject to compliance with requirements, provide Ademco 269R Panic Button.
3. Listing Criteria:
  - a. Listed and labeled by a qualified electrical testing agency for compliance with UL 639.
  - b. Listed and labeled by a qualified electrical testing agency for compliance with SIA CP-01.
4. Standard Features:
  - a. A switch with a shroud over the activating lever that allows an individual to covertly send a duress signal to master control unit, with no visible or audible indication when activated.
  - b. Switch locks in activated position until reset with a key.
  - c. Minimum Switch Rating: 50,000 operations.
  - d. Push Button: Finger activated, suitable for mounting on horizontal or vertical surface.

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## 2.3 NOTIFICATION DEVICES

### A. Intrusion Detection Alarm Strobe:

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. Alarm Controls; Hanchett Entry Systems, Inc.; ASSA ABLOY Group
  - b. Cooper Wheelock; brand of Eaton
  - c. Edwards; Carrier Global Corporation
  - d. Honeywell International Inc.
  - e. Potter Electric Signal Company, LLC
2. Listing Criteria:
  - a. Listed and labeled by a qualified electrical testing agency for compliance with UL 639.
  - b. Listed and labeled by a qualified electrical testing agency for compliance with UL 1638.
  - c. Listed and labeled by a qualified electrical testing agency for compliance with SIA CP-01.
  - d. FM Global Compliance: FM Approved and labeled perimeter security devices and equipment.
3. Standard Features:
  - a. Xenon light with blue polycarbonate lens.
  - b. Light Output: 115 cd, minimum.
  - c. Flash Rate: 60 per minute.

## 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 intrusion detection.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.
- D. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.
  1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.

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2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.
- E. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SYSTEM INTEGRATION

- A. Integrate intrusion detection system with the following systems and equipment:
  1. Electronic door hardware.
  2. Intercommunications and program systems.
  3. Access control.
  4. Fire-alarm system.
  5. Video surveillance.

### 3.3 INSTALLATION OF INTRUSION DETECTION

- A. Comply with UL 681 and NFPA 731.
- B. Connecting to Existing Equipment: Verify that existing perimeter security system is operational before making changes or connections.
  1. Connect new equipment to existing control panel in existing part of the building.
  2. Connect new equipment to existing monitoring equipment at the Supervising Station.
  3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to the new points. New components must be capable of merging with existing configuration without degrading the performance of either system.
- C. Wiring Method:
  1. Install wiring in metal raceways according to Section 270528 "Pathways for Communications Systems." Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size must be metric designator 13 (trade size 1/2). Control and data transmission wiring may not share conduit with other building wiring systems.
  2. Install wiring in metal raceways according to Section 270528 "Pathways for Communications Systems," except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size must be metric designator 13 (trade size 1/2). Control and data transmission wiring may not share conduit with other building wiring systems.
  3. Cable, concealed in accessible ceilings, walls, and floors when possible.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal

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according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Wires and Cables:

1. Conductors: Size as recommended in writing by system manufacturer unless otherwise indicated.
2. 120 V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable unless otherwise indicated or if manufacturer recommends shielded cable, according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
4. Data and Television Signal Transmission Cables: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

F. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

G. Install power supplies and other auxiliary components for detection devices at control units unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

H. Identify components with engraved, laminated-plastic or metal nameplate for master control unit and each terminal cabinet, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems" and Section 270528 "Pathways for Communications Systems."

### 3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with identification requirements in Section 260553 "Identification for Electrical Systems" and Section 270528 "Pathways for Communications Systems."
- B. Install instructions frame in a location visible from master control unit.

### 3.5 GROUNDING

- A. Ground the master control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to master control unit.
- B. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- C. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5  $\Omega$  ground. Measure, record, and report ground resistance.
- D. Install grounding electrodes of type, size, location, and quantity indicated. Comply with installation requirements in Section 260526 "Grounding and Bonding for Electrical Systems" and Section 270528 "Pathways for Communications Systems."

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### 3.6 FIELD QUALITY CONTROL

- A. Administrant for Security Tests and Inspections:
  - 1. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
  - 2. Administer and perform tests and inspections with assistance of factory-authorized service representative.
- B. Acceptance Testing Preparation: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
  - 1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
- C. Field tests and inspections must be witnessed by Owner.
- D. Tests and Inspections: Comply with provisions in NFPA 731, Ch. 9, "Testing and Inspections."
  - 1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
  - 2. Test Methods: Intrusion detection systems and other systems and equipment that are associated with detection and accessory equipment must be tested according to Table "Test Methods" and Table "Test Methods of Initiating Devices."
- E. Documentation: Comply with provisions in NFPA 731, Ch. 4, "Documentation."
- F. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.
- G. Nonconforming Work:
  - 1. Intrusion detection system will be considered defective if it does not pass tests and inspections.
- H. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.
- I. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.
  - 1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.



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3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose. Visits for this purpose must be in addition to any required by warranty.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the intrusion detection system. Comply with documentation provisions in NFPA 731, Ch. 4, "Documentation and User Training."

END OF SECTION

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SECTION 284621.11 - ADDRESSABLE FIRE-ALARM 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. Existing fire-alarm system to be modified.
2. Addressable fire-alarm system.
3. Fire-alarm control unit (FACU).
4. Manual fire-alarm boxes.
5. System smoke detectors.
6. Fire-alarm notification appliances.
7. Fire-alarm addressable interface devices.

- B. The fire alarm system must be an extension of the existing Honeywell Enterprise Building Integrator System with host server hardware located in Augusta, ME. The system is for monitoring and controlling of fire alarm panels and associated devices. The system must be seamlessly integrated with the State of Maine Building Control Center (BCC) which provides 24 hours a day, 7 days a week, 365 days a year monitoring of state facilities. Graphics, Integration of Honeywell XLS fire panels, sprinkler systems, boards and front-end programming are proprietary to Honeywell International Inc.

C. Related Requirements:

1. Section 087100 "Door Hardware" for magnetic door holders that release in response to fire-alarm outputs.
2. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260523 "Control Voltage Electrical Power Cables" for cables and conductors for fire-alarm systems.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FACU: Fire-alarm control unit.
- C. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.

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- D. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the 2007 Energy Independence and Security Act (EISA).
- E. NICET: National Institute for Certification in Engineering Technologies.
- F. PC: Personal computer.
- G. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
  - 1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
  - 2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

#### 1.4 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. When new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

#### 1.5 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Approved Permit Submittal: Submittals must be approved by authorities having jurisdiction prior to submitting them to Architect.
- C. 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.
- D. Shop Drawings: For fire-alarm system.
  - 1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
  - 2. Include plans, elevations, sections, and details, including details of 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.

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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 written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
  9. Include performance parameters and installation details for each detector.
    - a. Locate detectors in accordance with manufacturer's written instructions.
  10. 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.
- E. Delegated Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.
1. Drawings showing location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of device.
  2. Design Calculations: Calculate requirements for selecting spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
  3. Indicate audible appliances required to produce square wave signal per NFPA 72.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Field quality-control reports.
- C. Qualification Statements: For Installer.
- D. Sample Warranty: Submittal must include line item pricing for replacement parts and labor.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
  1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.

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- b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
- c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
- d. Riser diagram.
- e. Device addresses.
- f. Record copy of site-specific software.
- g. Provide "Inspection and Testing Form" in accordance with "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
  - 1) Equipment tested.
  - 2) Frequency of testing of installed components.
  - 3) Frequency of inspection of installed components.
  - 4) Requirements and recommendations related to results of maintenance.
  - 5) Manufacturer's user training manuals.
- h. Manufacturer's required maintenance related to system warranty requirements.
- i. Abbreviated operating instructions for mounting at FACU and each annunciator unit.

C. Software and Firmware Operational Documentation:

- 1. Software operating and upgrade manuals.
- 2. Program Software Backup: On USB media and approved online or cloud solution.
- 3. Device address list.
- 4. Printout of software application and graphic screens.

## 1.8 QUALITY ASSURANCE

A. Installer Qualifications:

- 1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
- 2. Installation must be by personnel certified by NICET as fire-alarm Level II technician.
- 3. Obtain certification by NRTL in accordance with NFPA 72.
- 4. Licensed or certified by authorities having jurisdiction.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail because of defects in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 EXISTING FIRE-ALARM SYSTEM TO BE MODIFIED

- A. Basis for Pricing: XLS 3000 (Honeywell) and XLS 140-2 (Honeywell).
- B. Description: Intelligent addressable fire alarm control panel, stand-alone, one to ten signal line circuits (SLC), network capable.
- C. Source Limitations for Fire-Alarm System and Components: Components must be compatible with, and operate as extension of, existing system. Provide system manufacturer's certification that components provided have been tested as, and will operate as, a system.

2.2 ADDRESSABLE FIRE-ALARM SYSTEM

- A. Description:
  - 1. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn-and-strobe notification for evacuation.
- B. Performance Criteria:
  - 1. Regulatory Requirements:
    - a. Fire-Alarm Components, Devices, and Accessories: Listed and labeled by a NRTL in accordance with NFPA 70 for use with selected fire-alarm system and marked for intended location and application.
  - 2. General Characteristics:
    - a. Automatic sensitivity control of certain smoke detectors.
    - b. Fire-alarm signal initiation must be by one or more of the following devices:
      - 1) Manual stations.
      - 2) Smoke detectors.
      - 3) Automatic sprinkler system water flow.
    - c. Fire-alarm signal must initiate the following actions:
      - 1) Continuously operate alarm notification appliances.
      - 2) Identify alarm and specific initiating device at FACU, connected network control panels.
      - 3) Transmit alarm signal to 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 HVAC 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.

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- 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 system memory.
  - 17) Record events by system printer.
  - 18) Indicate device in alarm on graphic annunciator.
- d. Supervisory signal initiation must be by one or more of the following devices and actions:
- 1) Valve supervisory switch.
  - 2) High- or low-air-pressure switch of dry-pipe or preaction sprinkler system.
  - 3) Alert and Action signals of air-sampling detector system.
  - 4) Elevator shunt-trip supervision.
  - 5) Independent fire-detection and -suppression systems.
  - 6) Fire pump is running.
  - 7) Fire pump has lost power.
  - 8) Power to fire pump has phase reversal.
  - 9) Zones or individual devices have been disabled.
  - 10) FACU has lost communication with network.
- e. System trouble signal initiation must 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 addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
  - 4) Loss of primary power at FACU.
  - 5) Ground or single break in internal circuits of FACU.
  - 6) Abnormal ac voltage at FACU.
  - 7) Break in standby battery circuitry.
  - 8) Failure of battery charging.
  - 9) Abnormal position of switch at FACU or annunciator.
  - 10) Voice signal amplifier failure.
  - 11) Hose cabinet door open.
- f. System Supervisory Signal Actions:
- 1) Initiate notification appliances.
  - 2) Identify specific device initiating event at FACU, connected network control panels.
  - 3) Record event on system printer.
  - 4) After time delay of 200 seconds, transmit trouble or supervisory signal to remote alarm receiving station.
  - 5) Transmit system status to building management system.
  - 6) Display system status on graphic annunciator.

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g. Network Communications:

- 1) Provide network communications for fire-alarm system in accordance with fire-alarm manufacturer's written instructions.
- 2) Provide network communications pathway per manufacturer's written instructions and requirements in NFPA 72 and NFPA 70.
- 3) Provide integration gateway using BACnet for connection to building automation system.

h. System Printer:

- 1) Printer must be listed and labeled as integral part of fire-alarm system.

i. Device Guards:

- 1) Description: Welded wire mesh of size and shape for manual station, smoke detector, gong, or other device requiring protection.
  - a) Factory fabricated and furnished by device manufacturer.
  - b) Finish: Paint of color to match protected device.

j. Document Storage Box:

- 1) Description: Enclosure to accommodate standard 8-1/2-by-11 inch manuals and loose document records. Legend sheet will be permanently attached to door for system required documentation, key contacts, and system information. Provide two key ring holders with location to mount standard business cards for key contact personnel.
- 2) Material and Finish: 18-gauge cold-rolled steel; four mounting holes.
- 3) Color: Red powder-coat epoxy finish.
- 4) Labeling: Permanently screened with 1 inch high lettering "SYSTEM RECORD DOCUMENTS" with white indelible ink.
- 5) Security: Locked with 3/4 inch barrel lock. Provide solid 12 inch stainless steel piano hinge.

## 2.3 FIRE-ALARM CONTROL UNIT (FACU)

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Honeywell International, Inc.

B. Description: Field-programmable, microprocessor-based, modular, power-limited design with electronic modules.

C. Performance Criteria:

1. Regulatory Requirements: Comply with NFPA 72 and UL 864.
2. General Characteristics:



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- a. System software and programs must be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining information through failure of primary and secondary power supplies.
- b. Include real-time clock for time annotation of events on event recorder and printer.
- c. Provide communication between FACU and remote circuit interface panels, annunciators, and displays.
- d. FACU must be listed for connection to central-station signaling system service.
- e. Provide nonvolatile memory for system database, logic, and operating system and event history. System must require no manual input to initialize in the event of complete power down condition. FACU must provide minimum 500-event history log.
- f. Addressable Initiation Device Circuits: FACU must indicate which communication zones have been silenced and must provide selective silencing of alarm notification appliance by building communication zone.
  - 1) Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: FACU must be listed for releasing service.
- g. Fire-Alarm Annunciator: Arranged for interface between human operator at FACU and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and programming and control menu.
  - 1) Annunciator and Display: LCD, 80 characters, minimum.
  - 2) Keypad: Arranged to permit entry and execution of programming, display, and control commands.
- h. Alphanumeric Display and System Controls: Arranged for interface between human operator at FACU and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and programming and control menu.
  - 1) Annunciator and Display: LCD, two line(s) of 40 characters, minimum.
  - 2) Keypad: Arranged to permit entry and execution of programming, display, and control commands.
- i. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
  - 1) Pathway Class Designations: NFPA 72, Class A.
  - 2) Pathway Survivability: Level 1.
  - 3) Install no more than 100 addressable devices on each signaling-line circuit.
  - 4) Install fault circuit isolators to comply with circuit performance requirements of NFPA 72 or with manufacturer's written instructions, whichever is more conservative.
- j. Serial Interfaces:
  - 1) One dedicated RS 485 port for central-station operation using point ID DACT.
  - 2) One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
  - 3) One USB or RS 232 port for PC configuration.

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- 4) One RS 232 port for air-aspirating smoke detector connection.
  - 5) One RS 232 port for voice evacuation interface.
- k. Smoke-Alarm Verification:
- 1) Initiate audible and visible indication of "alarm-verification" signal at FACU.
  - 2) Activate approved "alarm-verification" sequence at FACU and detector.
  - 3) Record events by system printer.
  - 4) Sound general alarm if alarm is verified.
  - 5) Cancel FACU indication and system reset if alarm is not verified.
- l. Notification-Appliance Circuit:
- 1) Audible appliances must sound in three-pulse temporal pattern, as defined in NFPA 72.
  - 2) Visual alarm appliances must flash in synchronization where multiple appliances are in same field of view, as defined in NFPA 72.
- m. Elevator Recall: Initiate by one of the following alarm-initiating devices:
- 1) Elevator lobby detectors except lobby detector on designated floor.
  - 2) Smoke detectors in elevator machine room.
  - 3) Smoke detectors in elevator hoistway.
- n. Elevator controller must be programmed to move cars to alternate recall floor if lobby detectors located on designated recall floors are activated.
- o. Water-flow alarm connected to sprinkler in elevator shaft and elevator machine room must shut down elevators associated with location without time delay.
- 1) Water-flow switch associated with sprinkler in elevator pit may have delay to allow elevators to move to designated floor.
- p. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls must be connected to fire-alarm system.
- q. Remote Smoke-Detector Sensitivity Adjustment: Controls must 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 final adjusted values on system printer.
- r. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to remote alarm station.
- s. Primary Power: 24 V(dc) obtained from 120 V(ac) service and power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, and supervisory signals must be powered by 24 V(dc) source.
- t. Alarm current draw of entire fire-alarm system must not exceed 80 percent of power-supply module rating.
- u. Secondary Power: 24 V(dc) supply system with batteries, automatic battery charger, and automatic transfer switch.
- v. Batteries: Sealed lead calcium.

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- w. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provides as special module that is part of FACU.
- x. Indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of central-control microphone. Amplifiers must comply with UL 1711.
  - 1) Allow application of, and evacuation signal to, indicated number of zones and simultaneously allow voice paging to other zones selectively or in combination.
  - 2) Programmable tone and message sequence selection.
  - 3) Standard digitally recorded messages for "Evacuation" and "All Clear."
  - 4) Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification-appliance circuits of FACU.
- y. Status Annunciator: Indicate status of various voice/alarm speaker zones and status of firefighters' two-way telephone communication zones.
- z. Preamplifiers, amplifiers, and tone generators must automatically transfer to backup units, on primary equipment failure.

D. Accessories:

- 1. Instructions: Computer printout or typewritten instruction card mounted behind plastic or glass cover in stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe functional operation of system under normal, alarm, and trouble conditions.
- 2. Preaction System Functionality:
  - a. Initiate Presignal Alarm: This function must cause audible and visual alarm and indication to be provided at FACU. Activation of initiation device connected as part of preaction system must be annunciated at FACU only, without activation of general evacuation alarm.

## 2.4 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

- 1. Honeywell International, Inc.

B. Boxes: Comply with UL 38. Boxes must be finished in red with molded, raised-letter operating instructions in contrasting color; must show visible indication of operation; and must be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

- 1. Single-action mechanism, type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to FACU.
- 2. Double-action mechanism requiring two actions to initiate alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to FACU.

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3. Station Reset: Key- or wrench-operated switch.
4. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at top to permit lifting for access to initiate alarm. Lifting cover actuates integral battery-powered audible horn intended to discourage false-alarm operation.
5. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at top to permit lifting for access to initiate alarm.
6. Able to perform at up to 90 percent relative humidity at 90 deg F.
7. Material: Manual stations made of Lexan polycarbonate.
8. Able to be used in indoor areas.

## 2.5 SYSTEM SMOKE DETECTORS

### A. Photoelectric Smoke Detectors:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Honeywell International, Inc.
2. Performance Criteria:
  - a. Regulatory Requirements:
    - 1) NFPA 72.
    - 2) UL 268.
  - b. General Characteristics:
    - 1) Detectors must be four-wire type.
    - 2) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
    - 3) Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Provide terminals in fixed base for connection to building wiring.
    - 4) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
    - 5) Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
    - 6) Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
    - 7) Operator at FACU, having designated access level, must 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.).
    - 8) Detector must have functional humidity range within 10 to 90 percent relative humidity.

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- 9) Color: White.
- 10) Remote Control: Unless otherwise indicated, detectors must be digital-addressable type, individually monitored at FACU for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by FACU.
- 11) Rate-of-rise temperature characteristic of combination smoke- and heat-detection units must be selectable at FACU for 15 or 20 deg F per minute.
- 12) Fixed-temperature sensing characteristic of combination smoke- and heat-detection units must be independent of rate-of-rise sensing and must be settable at FACU to operate at 135 or 155 deg F.
- 13) Multiple levels of detection sensitivity for each sensor.
- 14) Sensitivity levels based on time of day.

## 2.6 FIRE-ALARM NOTIFICATION APPLIANCES

### A. Fire-Alarm Audible Voice/Tone Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Honeywell International, Inc.
2. Description: Notification appliance capable of outputting voice evacuation messages.
3. Performance Criteria:
  - a. Regulatory Requirements:
    - 1) NFPA 72.
    - 2) UL 1480.
  - b. General Characteristics:
    - 1) Speakers for Voice Notification: Locate speakers for voice notification to provide intelligibility requirements of "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
    - 2) Low-Range Units: Rated 1 to 2 W.
    - 3) Mounting: Flush.
    - 4) Match Transformers: Tap range matched to acoustical environment of speaker location.
    - 5) Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

### B. Fire-Alarm Visible Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Honeywell International, Inc.
2. Performance Criteria:

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- a. Regulatory Requirements:
  - 1) NFPA 72.
  - 2) UL 1971.
- b. General Characteristics:
  - 1) Rated Light Output:
    - a) 15/30/75/110 cd, selectable in field.
  - 2) Clear or nominal white polycarbonate lens mounted on aluminum faceplate.
  - 3) Mounting: Wall mounted unless otherwise indicated.
  - 4) For units with guards to prevent physical damage, light output ratings must be determined with guards in place.
  - 5) Flashing must be in temporal pattern, synchronized with other units.
  - 6) Strobe Leads: Factory connected to screw terminals.
  - 7) Mounting Faceplate: Factory finished, red.

## 2.7 FIRE-ALARM ADDRESSABLE INTERFACE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

- 1. Honeywell International, Inc.

- B. Performance Criteria:

- 1. Regulatory Requirements:
  - a. NFPA 72.
- 2. General Characteristics:
  - a. Include address-setting means on module.
  - b. Store internal identifying code for control panel use to identify module type.
  - c. Listed for controlling HVAC fan motor controllers.
  - d. Monitor Module: Microelectronic module providing system address for alarm-initiating devices for wired applications with normally open contacts.
  - e. Integral Relay: Capable of providing direct signal to elevator controller to initiate elevator recall to circuit-breaker shunt trip for power shutdown.
    - 1) Allow control panel to switch relay contacts on command.
    - 2) Have minimum of two normally open and two normally closed contacts available for field wiring.
  - f. Control Module:
    - 1) Operate notification devices.
    - 2) Operate solenoids for use in sprinkler service.

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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 PREPARATION

- A. Preinstallation Testing: Perform verification of functionality of installed components of existing system prior to starting work. Document equipment or components not functioning as designed.
- B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service in accordance with requirements indicated:
  - 1. Notify Architect, Construction Manager, and no fewer than fourteen days in advance of proposed interruption of fire-alarm service.
  - 2. Do not proceed with interruption of fire-alarm service without Owner's written permission.
- C. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

3.3 INSTALLATION OF EQUIPMENT

- A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install 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 other trades have completed cleanup must be replaced.
  - 2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

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1. Remove, salvage, and relocate existing fire alarm control panel as indicated. Extend existing-to-remain circuits to relocated control panel.
  2. Connect new equipment to relocated control panel.
  3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control functions to new points. New components must be capable of merging with existing configuration without degrading performance of either system.
- C. Install wall-mounted equipment, with tops of cabinets not more than 78 inch above finished floor.
- D. Manual Fire-Alarm Boxes:
1. Install manual fire-alarm box in normal path of egress within 60 inch of exit doorway.
  2. Mount manual fire-alarm box on background of contrasting color.
  3. Operable part of manual fire-alarm box must be between 42 and 48 inch above floor level. Devices must be mounted at same height unless otherwise indicated.
- E. Smoke- and Heat-Detector Spacing:
1. Comply with "Smoke-Sensing Fire Detectors" section in "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
  2. Smooth ceiling spacing must not exceed 30 ft..
  3. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas must be determined in accordance with Annex A or Annex B in NFPA 72.
  4. HVAC: Locate detectors not closer than 60 inch from air-supply diffuser or return-air opening.
  5. Lighting Fixtures: Locate detectors not closer than 12 inch from lighting fixture and not directly above pendant mounted or indirect lighting.
- F. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.
- G. Audible Alarm-Indicating Devices: Install not less than 6 inch below ceiling. Install on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.
- H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inch below ceiling. Install devices at same height unless otherwise indicated.
- I. Device Location-Indicating Lights: Locate in public space near device they monitor.

### 3.4 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.



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- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
  - 1. Nameplate must be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
  - 2. Nameplate must be laminated acrylic or melamine plastic signs with black background and engraved white letters at least 1/2 inch high.

### 3.5 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
- C. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

### 3.6 PATHWAYS

- A. Pathways above recessed ceilings and in inaccessible locations may be routed exposed.
  - 1. Exposed pathways located less than 96 inch above floor must be installed in EMT.
- B. Pathways must be installed in EMT.
- C. Exposed EMT must be painted red enamel.

### 3.7 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 supervised interface device to the following devices and systems. Install interface device less than 36 inch from device controlled. Make addressable confirmation connection when such feedback is available at 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.

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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 dead-phase or phase-reversal condition.
16. Supervisory connections at fire-pump engine control panel.

### 3.8 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 location visible from FACU.

### 3.9 GROUNDING

- A. Ground FACU and associated circuits in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Ground shielded cables at control panel location only. Insulate shield at device location.

### 3.10 FIELD QUALITY CONTROL

- A. Field tests must be witnessed by authorities having jurisdiction.
- B. Administrant for Tests and Inspections:
  1. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
  1. Visual Inspection: Conduct visual inspection prior to testing.
    - a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
    - b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.
  2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.

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3. Test audible appliances for public operating mode in accordance with manufacturer's written instructions. Perform test using portable sound-level meter complying with Type 2 requirements in ASA S1.4 Part 1/IEC 61672-1.
  4. Test visible appliances for public operating mode in accordance with manufacturer's written instructions.
  5. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
- D. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION

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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. Removing trees and grubbing out stumps.
4. Stripping topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing or abandoning site utilities.
7. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Work of this section requires careful coordination with the Owner to minimize disruption to on-going owner operations.

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. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

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1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Record Drawings: Identifying and accurately showing locations of above and below grade utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, parking areas, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, access drives, parking areas, walks, or other adjacent occupied or used facilities without permission from Owner.
  - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner.
- B. 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 Owner not less than 10 days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises.
- D. Utility Locator Service: Notify the Maine "Dig Safe System" (Call 811) before site clearing. In addition, contact non-DIGSAFE member utility service providers for review and markout of non-member utilities.
- E. Contract with a private underground utility locating company for locating and marking existing underground utilities on the project site. Maintain the utility markout for the duration of the project.
- F. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- G. Soil Stripping and Handling: Perform only when the soil is dry or slightly moist.

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- H. Burning: On-site burning is not permitted.

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.
- B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #23 (surface-tolerant, anticorrosive metal primer) or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees and other vegetation to remain have been flagged and that protection zones have been identified.
- C. 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 waterways, adjacent properties, and adjacent areas of the site. Refer to drawings for additional requirements.
- B. Erosion and sedimentation control measures must be in accordance with the Maine Erosion and Sediment Control Practices Field Guide for Contractors, latest edition.
- 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.

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3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

3.4 EXISTING UTILITIES

- A. Coordinate with Owner for work on existing utilities that serve existing structures.
- B. 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 Owner not less than 10 days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
- D. Excavate, expose and remove underground utilities indicated to be removed.

3.5 TREE REMOVAL AND GRUBBING

- A. Remove obstructions, trees, shrubs, stumps, 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. Where stump removal is indicated, grind or remove stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade, or as required for other work.
  - 3. Remove stumps, merchantable and non-merchantable timber, limbs, tops, shrubs and brush from Owner's property. Dispose of removed material in accordance with applicable laws, rules, and regulations.
- 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, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove heavy sod and grass before stripping topsoil.
- B. Strip topsoil to depth encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

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1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Do not stockpile topsoil on Site.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, and aggregate base and subbase courses as indicated.
  1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing concrete or pavement to remain before removing adjacent existing concrete or 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.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Remove trees, shrubs, stumps and brush and legally dispose of them off Owner's property.
- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION



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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. Maine Department of Transportation Standard Specifications, latest edition (MDOT). Measurement and payment provisions of MDOT do not apply to this Project.
- C. Existing soil boring logs are included as part of the Geotechnical Engineering Report attached at the end of this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Preparing subgrades for foundations, slabs-on-grade, walks, and other areas.
  - 2. Excavating and backfilling for structures.
  - 3. Crushed stone for subsurface drainage.
  - 4. Subbase course for concrete walks.
  - 5. Subbase and base course for asphalt paving.
  - 6. Structural fill and other soil materials.
  - 7. Excavating and backfilling trenches for utilities and pits for buried utility structures.
  - 8. Geotextile (filter fabric).
- B. Related Requirements:
  - 1. Section 311000 "Site Clearing" for stripping, topsoil, and removal of above- and below-grade improvements and utilities.
  - 2. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.3 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
- 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, or conduit and material placed beside and over pipe or conduit in a trench, including haunches to support sides of pipe or conduit.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

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- E. 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 Owner. 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 in width and more than 30 feet in length.
  - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner. Unauthorized excavation, as well as remedial work directed by Owner, shall be without additional compensation.
- F. Fill: Soil materials used to raise existing grades.
- G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 2 cu. yds. for bulk excavation or 1 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
  - 1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
  - 2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.
- H. 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.
- I. 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 walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at Project site.
  - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
    - a. Personnel and equipment needed to make progress and avoid delays.
    - b. Coordination of Work with Owner and with utility locator service.

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- c. Field quality control.

#### 1.5 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Product Data: For each type of the following manufactured products required:
  - 1. Geotextiles.
  - 2. Warning tapes.
- C. Material Test Reports: For each on-site and borrow soil material proposed for satisfactory soil as follows:
  - 1. Classification according to ASTM D 2487.
  - 2. Laboratory compaction curve according to ASTM D 1557.
- D. Material Test Reports: For each borrow soil material proposed for select soil materials as follows:
  - 1. Gradation analysis according to ASTM C 136 and ASTM C 117.
  - 2. Laboratory compaction curve according to ASTM D 1557.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Qualification Data: For qualified testing agency.

#### 1.7 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

#### 1.8 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.

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- B. Utility Locator Service: Notify the Maine "Dig Safe System" (Call 811) before beginning earth-moving operations. In addition, contact non-DIGSAFE member utility service providers for review and markout of non-member utilities.
- C. Contract with a private underground utility locating company for locating and marking existing underground utilities on the project site. Maintain the utility markout for the duration of the project
- D. Do not commence earth-moving operations until temporary erosion and sedimentation control measures are in place.
- E. Existing soil boring logs are included as part of the Geotechnical Engineering Report attached at the end of this Section.

## 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, GC, SW, SP, SM, and SC according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups 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.

### 2.2 SELECT SOIL MATERIALS

- A. General: Provide borrow select soil materials unless indicated otherwise.
- B. Base Material: Aggregate base shall conform to the Maine Department of Transportation Standard Specifications, Highways and Bridges (MDOT), Subsection 703.06, Type A, crushed.
- C. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; Maine Department of Transportation Standard Specifications, Highway and Bridges (MDOT), Subsection 703.06, Type D, except maximum particle size shall be 4 inches.
- D. Structural Fill: Clean-graded, non-frost susceptible sand and gravel mixture free of deleterious materials, meeting following gradation requirements:

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| Screen or Sieve Size | Percent Passing |
|----------------------|-----------------|
| 4 inches             | 100             |
| 3 inches             | 90-100          |
| 1/4 inch             | 25-90           |
| No. 40               | 0-30            |
| No. 200              | 0-6             |

- E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2321, Class IB or II; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Crushed Stone: Washed, 3/4-inch crushed stone conforming to MDOT Subsection 703.13, gradation as follows:

| Sieve Size | Percent Finer by Weight |
|------------|-------------------------|
| 1 inch     | 100                     |
| 3/4 inch   | 90-100                  |
| 1/2 inch   | 20-55                   |
| 3/8 inch   | 0-15                    |
| No. 4      | 0-5                     |

- G. Granular Borrow: MDOT Subsection 703.19, Granular Borrow, Material for Underwater Backfill, except the maximum particle size is 3 -inches.

## 2.3 GEOTEXTILES

- A. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
- Survivability: Class 2; AASHTO M 288.
  - Grab Tensile Strength: 150 lbf; ASTM D 4632.
  - Grab Elongation: 50%; ASTM D 4632.
  - Trapezoid Tear Strength: 60 lbf; ASTM D 4533.
  - Puncture Strength: 95 lbf; ASTM D 4833.
  - Apparent Opening Size: No. 70-100 sieve, maximum; ASTM D 4751.
  - Permittivity: 1.3 per second, minimum; ASTM D 4491.
  - UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355.

## 2.4 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
- Red: Electric.
  - Orange: Telephone and other communications.
  - Blue: Water systems.
  - Green: Sewer systems.

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- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene 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 the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
  2. Orange: Telephone and other communications.
  3. Blue: Water systems.
  4. Green: Sewer systems.

### 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. Provide 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.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. 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.
- D. 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.

#### 3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

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3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate 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 soil materials as directed by the Architect.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. 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 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. Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR ASPHALT AND CONCRETE PAVEMENTS

- A. Excavate surfaces under 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.
- 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 higher than top of pipe or conduit unless otherwise indicated.
  - 1. Clearance: As indicated.
- C. Trench Bottoms: Excavate trenches 6 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Remove projecting stones and sharp objects along trench subgrades.

3.8 SUBGRADE PREPARATION AND INSPECTION

- A. Do not disturb existing subgrades.

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- B. Notify Owner when excavations have reached required subgrade.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner, without additional compensation.
- D. Refer to drawings for additional requirements.

### 3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations, wall footings, pipe, or conduit as directed by Architect.

### 3.10 STORAGE OF SOIL MATERIALS

- A. Do not stockpile soil materials on-site.

### 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, waterproofing, and perimeter insulation.
  2. Surveying locations of underground utilities for Record Documents.
  3. Testing and inspecting underground utilities.
  4. Removing concrete form work.
  5. Removing trash and debris.
  6. Removing temporary shoring, bracing, and sheeting.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.
- C. Backfill with structural fill within 3-feet of foundation walls and footings.
- D. Backfill with granular borrow where indicated.

### 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. Place and compact bedding material to a height of 6 inches over the pipe or conduit.
  1. Carefully compact bedding material 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.
- D. Place and compact final backfill of satisfactory soil to final subgrade elevation.



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- E. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under gravel surfaces.

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 building slabs, use structural fill.
  - 4. Under footings and foundations, use structural fill.
  - 5. For foundation wall backfill, use structural 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 in loose depth for material compacted by heavy compaction equipment and not more than 4 inches 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 1557:
  - 1. Compact structural fill and granular borrow at 95 percent.
  - 2. Under structures, walks and pavements, compact existing subgrade and each layer of backfill or fill soil material at 95 percent.
  - 3. Under turf areas, compact subgrade and each layer of backfill or fill soil material at 90 percent.
  - 4. For utility trenches, compact each layer of bedding material at 90 percent.

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### 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 Areas: Plus or minus 1 inch.
  - 2. Paved and Concrete Areas: Plus or minus 1/2 inch.
- C. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2-inch when tested with a 10-foot straight edge.

### 3.17 SUBSURFACE DRAINAGE

- A. Refer to Section 334600 "Subdrainage."

### 3.18 SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements as follows:
  - 1. Place base course over subbase course under hot-mix asphalt pavement.
  - 2. Place subbase course over prepared subgrade under concrete walks.
  - 3. Shape subbase and base course to required crown elevations and cross-slope grades.
  - 4. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
  - 5. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 6. Compact subbase 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 1557.
- C. Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and aggregate surface layer to not less than 92 percent of maximum dry unit weight according to ASTM D 1557.

### 3.19 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified geotechnical engineering testing agency to perform tests and inspections.

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- 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. 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 or less of paved or concrete area but in no case fewer than three tests.
  - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
  - 3. Trench Backfill: At each compacted bedding and backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
- D. 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 Owner; 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

**R.W. Gillespie & Associates, Inc.**

Geotechnical Engineering • Environmental Consulting • Materials Testing Services

22 August 2024

Paul J. Miller, P.E., Project Engineer  
Oak Point Associates  
P.O. Box 1259  
Biddeford, Maine 04005

VIA EMAIL: [pmiller@oakpoint.com](mailto:pmiller@oakpoint.com)

Subject: Geotechnical Engineering Report  
Proposed One-Story Addition  
Burton M. Cross Building  
Augusta, Maine  
RWG&A Project No. 0767-175

Dear Mr. Miller:

R.W. Gillespie & Associates, Inc. (RWG&A) is pleased to present the results of the geotechnical engineering evaluation of the proposed addition to the Burton M. Cross Building at 11 Sewall Street in Augusta, Maine. The purpose of the services was to obtain information regarding subsurface conditions and soil properties to base recommendations for design and construction of the addition's foundations and ground floor slabs and determine site seismic characteristics for use in addition design. This evaluation was performed in general accordance with RWG&A Proposal No. P-11668.GI, dated 27 February 2024. The attached report presents the results of RWG&A's subsurface explorations, laboratory testing, engineering evaluations, and geotechnical engineering design recommendations for the project.

RWG&A has enjoyed working with Oak Point Associates on this project. If you have any questions, or if we may be of further service, please contact us.

Sincerely,  
R. W. GILLESPIE & ASSOCIATES, INC.

Temitope Omokinde  
Geotechnical Engineer

Erik J. Wiberg  
Principal Geotechnical Engineer

TO/EJW:fg

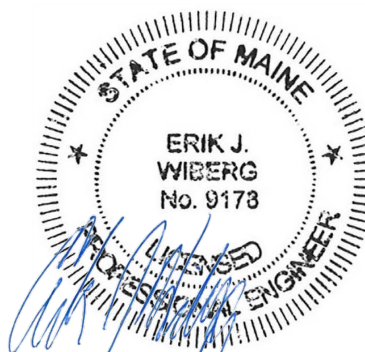
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**R.W. Gillespie & Associates, Inc.**

**Report  
of  
GEOTECHNICAL ENGINEERING EVALUATION  
for  
PROPOSED ONE-STORY ADDITION  
BURTON M. CROSS BUILDING  
AUGUSTA, MAINE**

**Prepared  
for  
OAK POINT ASSOCIATES  
BIDDEFORD, MAINE**

**Prepared  
by  
R. W. GILLESPIE & ASSOCIATES, INC.  
BIDDEFORD, MAINE**



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**Erik Wiberg  
State of Maine License No. 9178**

**R.W. Gillespie & Associates, Inc.****TABLE OF CONTENTS**

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**FIGURES:**

Figure 1. Locus Map

Figure 2. Exploration Location Plan

**APPENDICES:**

Appendix A. Limitations

Appendix B. Exploration Logs

Appendix C. Laboratory Test Results

## 1.0 INTRODUCTION

### 1.01 Background

The project site is the Burton M. Cross Building at 11 Sewall Street in Augusta, Maine. The approximate site location is shown in Figure 1, *Locus Map*. The proposed addition consists of two adjoining entry and exit vestibules at the south end of the office building. RWG&A's understanding of the proposed construction and existing conditions is based on communications with Oak Point Associates (OPA) and a review of information provided by email.

- Drawing AE101 titled *Partial First Floor Plans*, dated 08 February 2024, prepared by OPA, showing the addition's spaces relative to adjacent first-floor spaces within the building.
- Drawing Nos. CX101, CD101, CS101, CU101 from the plan set titled *Cross Building Security Screening Center, Augusta Maine* prepared by Oak Point Associates, marked 50% Submission, dated 21 August 2024.
- Drawings titled *Plot Plan, Foundation and Basement Plan, Foundations and Wall Sections, and Foundation Wall Elevations*, from the drawing set titled, *Maine State Office Building, Augusta Maine*, prepared by Miller & Beal, Inc. and Desmond & Lord, Inc. dated 24 April 1954.
- Structural loading and preliminary pile location plan provided in an email dated 07 August 2024; 03:22PM.

### 1.02 Scope of Services

This evaluation was performed to develop site-specific soil and laboratory data and to make geotechnical engineering evaluations for the proposed construction. The service was completed in general accordance with RWG&A's Proposal No. P-11668.GI, dated 27 February 2024. Refer to Appendix A for limitations and use of this report. As performed, RWG&A's scope of services included the following items:

1. Reviewed project information, readily available published subsurface information and geologic mapping and visited the site to observe surface conditions.
2. Prepared a geotechnical subsurface exploration and sampling program to obtain subsurface information for use in soil and foundation evaluations.
3. Contacted DigSafe and OK-to-DIG registered utilities and arranged for a private utility locating service to verify the proposed explorations were clear of underground utilities.
4. Arranged to have the soil borings performed by a local drilling contractor as a subcontractor to RWG&A. Provided technical monitoring of exploration activities so that depths, locations, and sampling methods could be modified in response to the subsurface conditions encountered. Observed, logged, and sampled the explorations.

5. Performed laboratory tests on selected soil samples recovered from the subsurface explorations to aid in soil description and determination of engineering properties needed for foundation design.
6. Conducted engineering evaluations of the geotechnical engineering aspects of the proposed project. Emphasis was placed on foundation type, allowable foundation loads, ground floor slabs, lateral load resistance, seismic site coefficient, perimeter foundation drainage, and excavations.
7. Prepared this report presenting the findings, conclusions, and recommendations of the geotechnical evaluation.

## **2.0 SUBSURFACE EXPLORATION**

The subsurface exploration program consisted of two soil borings designated B-1 and B-2. Northern Test Boring, Inc., of Gorham, Maine, drilled test borings on 21 June 2024 using a track-mounted drill rig. Figure 2 shows the approximate boring locations. The proposed exploration locations were selected with OPA based on access, utilities, and facility user considerations. Elevations shown on the logs were estimated using ground surface elevation contours shown in the plans provided. Locations and elevations should be considered accurate only to the degree implied by the methodology used to determine them.

The soil borings were advanced using 2-1/4 inch inside diameter hollow-stem augers. Split-barrel sampling with standard penetration testing (*ASTM D1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils*) was generally performed at about 2-foot intervals in the upper 7 feet and 5-foot intervals after that to refusal surfaces.

The soils encountered in the explorations were described in general accordance with *ASTM D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. Logs of the soil boring explorations are included in Appendix B. Stratification lines shown on the exploration logs represent the estimated boundaries between the different soil types encountered and approximate refusal depths; the actual transitions will be more gradual and vary over short distances. Subsurface information should only be considered representative of subsurface conditions encountered within the vertical reach of the explorations on the date the explorations were made.

## **3.0 LABORATORY TESTING**

Laboratory testing was performed to assist in describing and estimating the engineering properties of the soils. The laboratory testing program consisted of three particle-size distribution tests and one moisture content determination. The tests were performed in general accordance with the following methods and procedures:

- *ASTM D6913/6913M, Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.*



- *ASTM D2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.*

Moisture content test results are presented in the exploration logs. Results of other tests are presented in Appendix C, *Laboratory Test Results*. Tests were conducted at the RWG&A soil and materials testing laboratory in Biddeford, Maine, which is accredited by the American Association of State Highway and Transportation Officials (AASHTO) for the tests performed.

## **4.0 SUBSURFACE CONDITIONS**

The following paragraphs summarize the subsurface conditions encountered in the borings. Please refer to the exploration logs in Appendix B for detailed descriptions of conditions encountered at specific locations.

### **4.01 Subsurface Soils**

Subsurface conditions encountered in descending order consisted of topsoil fill granular fill, naturally deposited silty fine sand to sandy silt, and silty sand with gravel. Fill was about 2 to 8 feet thick was encountered in the exploration and below topsoil consisted of sand with little silt and trace gravel. The naturally deposited soils consisted of loose to medium dense silty sand to sandy silt marine deposits over silty sand with gravel glacial till deposits. Refusal surfaces were encountered at depths about 17.3 and 25.6 feet below ground surface.

Based on a review of record foundation design drawings, refusal surfaces were interpreted to be on bedrock but might have been on cobbles or boulders. Rock coring would be needed to verify the nature of the refusal surfaces.

### **4.02 Groundwater**

Free water was observed at depths of about 12 to 20 feet in the explorations below ground surface during the drilling. Water levels observed during drilling were influenced by the exploration methods (e.g., slow groundwater response due to low soil permeability) and are not considered representative of stabilized groundwater levels. Groundwater levels at the site will fluctuate due to season, temperature, rainfall, and construction activity; therefore, water levels during and following construction will vary from those observed in the explorations.

## **5.0 EVALUATION OF GEOTECHNICAL DATA**

### **5.01 General**

Engineering evaluations for this project are based on the subsurface explorations, laboratory testing data, and the design information available to RWG&A when this report was prepared. Should different information become known before or during construction, these evaluations should be reviewed by RWG&A to confirm their continued applicability.

## **5.02 Proposed Construction**

The proposed addition consists of a one-story addition enclosing two adjoining entry and exit vestibules at the south end of the office building. The addition projects about 17 feet from the building and extends about 33 feet along the face of the building. The addition area is a paved plaza with walkways abutting lawn areas. Site grades pitched down away from the building's entrance and from about elevation 131 to 132 feet.

It's understood that the finished ground floor elevation of the proposed addition will be equal to existing building's first-floor elevation. The building has a basement floor level about 10 feet below the first-floor level.

Geotechnical engineering evaluations were based on the following structural loads:

- Maximum walls: 3 kips per linear feet,
- Maximum Column loads: 24 kips,
- Pile allowable load: 40 kips.

RWG&A should be notified if loads or grades used in the evaluations vary from those used in the evaluations.

## **5.03 Foundation and Floor Slab Considerations**

The 1954 record drawings indicate that the building and foundation wall adjacent to the planned addition is supported on concrete caissons extending to bedrock or spread footings bearing on bedrock. The 1954 *Plot Plan* drawing indicates that the planned addition area was formerly occupied by a building removed as part of the Cross Office Building development. The extent of fill encountered in the borings, fill composition, method of site preparation before fill placements, and fill placement and compaction are uncertain.

RWG&A estimated about 1/2 to 3/4 inches of foundation settlement should be expected within the addition with proper site preparation and if supported on spread footings with a slab-on-grade ground floor. The total settlement would be equivalent to the differential settlements between the addition and building. Although the settlement might be tolerable with respect to structural stability, differential settlements might result in aesthetic crack damage in finishes and uneven floors near transitions.

In general, it is preferential to support additions on foundation types and subgrades similar to existing buildings to reduce issues associated with differential settlement. In addition, the presence of undocumented fill and uncertainty of site preparation increases project risk. Therefore, supporting the addition's foundation and ground floor slab on piles driven to end bearing is recommended.

Based on discussions with OPA about pile-types, low-displacement steel H piles are preferred based on proximity to the existing below-grade building foundation wall. Displacement shapes

like timber and pipe piles driven near the building would increase pressures against the existing building's below-grade wall and nearby utilities. It's understood that OPA's preliminary design is based on a 40-kip design with an axial pile capacity. H-pile recommendations are provided in Section 6.

#### **5.04 Construction Considerations**

Site Preparation: Fill was encountered in the explorations performed. Preparation of the site before the fill's placement, fill composition, and methods used to place the fill are uncertain. It should be anticipated that abandoned utilities or other underground construction might be encountered during construction and could conflict with new pile locations and/or grade beams for the proposed addition. It is anticipated that removal would be done by excavation where obstructions are less than 10 feet below ground surface. Excavated and removed obstructions should be backfilled with sand and/or flowable fill. New piles could then be driven on location to end bearing in dense sand deposits or on bedrock. If the obstructions are left in place, the location of the new pile should be offset to allow for driving adjacent to the obstruction. It should be noted that the new pile might kick off or wander away from the obstruction while driving.

Construction Dewatering: The on-site naturally deposited soils at proposed addition areas are sensitive to disturbance when wet. To reduce disturbance of exposed subgrade soils, diverting runoff, providing positive grading to shed seepage and runoff from flat areas, and compacting exposed soils to reduce rutting, ponding, and surface water infiltration will be important. RWG&A anticipates that if groundwater is encountered during construction, then groundwater control can be accomplished using ditches, sumps, and open pumping.

Vibrations During Construction: Vibrations from construction activities might deleteriously affect existing structures, occupants, and vibration-sensitive equipment. Settlements and vibrations will be greatest near the driven pile location and diminish with increasing distance from the pile. Vibrations from pile driving operations depend on the hammer used to drive the pile, pile type, and subsurface conditions, including end-bearing depth. A literature review suggests that guidelines for short-term vibration velocity on buried pipelines (e.g., water, sewer, gas) range from about 1 to 4 inches per second. Setting vibration limits arbitrarily too low might increase construction costs unnecessarily.

Use of On-site Soils: It is anticipated that the surficial topsoil and fill will be stripped and incorporated into proposed landscaped areas, where practicable, or hauled off-site. Topsoil and organic materials are not considered suitable for use as common fill. The subsurface soils from foundation and site work excavations will generally consist of granular fill and silty sand to sandy silt.

Visual-manual descriptions and laboratory tests indicate fill and naturally deposited soils are unsuitable for compacted fill below-grade beams and pile caps, and as structural fill and at exterior or unconditioned locations sensitive to frost heaving. With proper moisture conditioning and earthwork handling, existing fill and on-site materials may be used as common fill in landscaped areas. If on-site soils are proposed for use other than common fill, the soil should be stockpiled separately and tested to determine if it meets specification requirements for its intended use.

## **6.0 RECOMMENDATIONS**

The recommendations presented below are provided for use in the design and construction of the proposed buildings. Subsurface conditions at the project site will influence foundation design and site work construction. RWG&A recommends foundation design and construction comply with the requirements of all applicable ordinances, regulations, and rules. When this report was prepared, the applicable building code in Augusta, Maine, was the Maine Uniform Building and Energy Code, which adopts *2015 International Building Code*® (IBC 2015) by reference.

### **6.01 Site Preparation**

1. Due to the previously developed nature of the site, the Contractor should be sensitive to the potential of encountering obstructions such as remnants from prior structures and buildings, associated foundations, and underground utilities (note: both active and abandoned) during site work activities. It is anticipated that obstructions may include, but not be limited to concrete footings and buried utilities. Where such items are encountered, they should be excavated to their full extent, removed, and replaced with compacted fill except where otherwise recommended.

The ends of underground pipes and utility conduits outside the proposed construction areas abandoned in-place should be filled with concrete and capped to reduce the likelihood of material erosion into the conduit or pipe.

2. Site grading should provide positive drainage away from constructed facilities both during and after construction. Dewatering requirements will vary across the site depending on groundwater levels encountered during construction and soil types. In general, it should be practical to accomplish construction dewatering from within excavations using open sump and open pumping techniques. Surface runoff and groundwater infiltration should be controlled so excavation, filling, and foundation construction can be completed in the dry.  
The Contractor should provide adequate means and methods to manage groundwater flow from various sources including utility trenches that might be encountered during construction. Test excavations and observation wells made by the Contractor and observed by a qualified engineer should be used to determine appropriate dewatering means and methods.
3. Excavations adjacent to the buildings and utilities to remain should be designed to limit movements of the existing structures to tolerable amounts as determined by the Structural Engineer and Civil Engineer. The Contractor's excavation procedures, shoring and lateral support design, including lateral support for new construction, should be submitted for review by the Structural Engineer before construction.

### **6.02 Ground Vibrations During Construction**

4. Construction activities, including compaction with vibratory rollers and installation of driven piles, will cause ground vibrations and might be deleterious to nearby utilities and structures. Vibration and settlement tolerances and monitoring points for the nearby

structures and utilities should be established before construction. The as-built construction, foundation type, existing condition, and vibration tolerances should be determined before construction.

5. Ground vibration and settlement monitoring should be used during soil compaction and pile driving to measure the ground vibrations and verify ground vibrations are within tolerable amounts. Vibration monitoring by the Contractor would also help adjust pile installation means and methods, such as pile driving hammer type and sequence of installation to limit ground vibrations to tolerable amounts.
6. Before starting any vibration process, preconstruction surveys should be conducted to document the building condition, including cracks on adjacent structures. Emphasis should be placed on nearby vibration-sensitive structures, including plaster-walled buildings, vibration-sensitive equipment, wells, and utilities. Surveys of structures within a minimum distance of 0.25 times the square root of the impact hammer energy in foot-pounds should be conducted.

### **6.03 Site Filling**

7. Compacted structural fill is recommended as a backfill of pile caps, grade beams, piers, foundations, and new fill below ground floor slabs. It is anticipated that the Contractor will encounter fill in excavations that might not meet the requirements for structural fill or be suitable for use as backfill. Structural fill should be a clean, well-graded, low to non-frost susceptible, and free-draining sand and gravel mixture meeting the following gradation requirements:

| <b>Screen or Sieve Size</b> | <b>Percent Passing</b> |
|-----------------------------|------------------------|
| 6 inches                    | 100                    |
| 3 inches                    | 70 – 100               |
| No. 4                       | 35 – 70                |
| No. 40                      | 5 – 35                 |
| No. 200                     | 0 – 5                  |

Note: Maximum particle size limited to 2 inches within 3 feet of foundation walls, footings, and floor slabs or if compacted by hand-guided equipment.

8. In open areas, structural fill should be placed in level, uniform lifts not exceeding 12 inches in uncompacted thickness and be compacted with self-propelled compaction equipment. In confined areas and within 4 feet of foundation walls, structural fill should be placed in lifts not exceeding 6 inches in uncompacted thickness and be compacted with hand-operated compaction equipment. All fill placed for footing and slab support should be structural fill compacted to at least 95 percent of the maximum dry density as determined by *ASTM Standard D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))*.

9. Large compaction equipment may cause perceptible shaking inside and near existing buildings. This is due, in part, to the proximity of the proposed construction to existing buildings. The shaking might disturb occupants inside the building and cause items hanging on the walls to fall and windows to crack. Methods of reducing these vibrations include using smaller compaction equipment and compacting with vibratory energy at low settings or statically, if necessary. Compacting with low vibratory energy or statically will probably require thinner fill lifts and more passes/coverages with the equipment to achieve the necessary density.

#### **6.04 Foundations**

10. The proposed addition should be designed to withstand lateral, uplift, and overturning forces due to earthquakes. The in-place soils encountered in the explorations are not considered susceptible to liquefaction. Based on exploration methods used for this project, the seismic Site Class is D, per 2015 International Building Code (IBC) Section 1613.2.5, which references American Society of Civil Engineers (ASCE) Document 7, *ASCE Minimum Design Loads and Associated Criteria for Buildings and Other Structures*.
11. Steel piles driven to bedrock should be used to support building addition foundations and ground floor slab. Piles should be provided with hardened steel tips to protect the pile tips from damage during driving, and to increase the ability to seat the pile in or on bedrock. Based on the test borings, embedded pile lengths are anticipated to range from about 15 to 25 feet.
12. Recommended pile section alternatives are HP 8 x 36 and HP 10 x 42 structural steel (50 kips per square inch steel) using a design capacity of 40 kips (20 tons). Only one pile type and size should be used in the planned construction. The selected pile should be driven to a minimum ultimate capacity at the end of driving equal to 2.25 times the design axial load pile load testing, such as dynamic pile analyses, should be conducted per building code if axial pile loads exceed 80 kips (40 tons).
13. It is recommended that design bottom of pile caps for exterior locations supported on soils be a minimum of 5 feet below the lowest adjacent ground surface exposed to freezing temperatures. At heated interior locations, pile caps on soil or fill may be designed to bear a minimum of 2 feet below top of the ground floor slab. If exposure to freezing is anticipated, either during or following construction, interior pile caps should be lowered following the recommendations for exterior locations.
14. Lateral loads from wind and earthquake may be resisted by passive earth pressure on the sides of the pile caps and grade beams. Passive pressure against backfilled pile caps, grade beams, and foundation walls may be calculated using an equivalent fluid unit weight of 90 pounds per cubic foot, which is based on a passive pressure coefficient of 2.5, a structural fill backfill unit weight of 110 pounds per cubic foot, and a safety factor of 3 (note: 1/3 reduction to account for strain-compatibility with lateral pile resistance).
15. Where lateral load resistance from the passive earth pressure on the pile caps and grade beams is insufficient, battered piles could be used. The pile batter should be no steeper than 3 units horizontal to 12 units vertical (3H:12V).



16. The allowable lateral load capacity of the installed piles is 1 ton (2 kips). The allowable lateral load capacity should be reduced by the following factors for groups of piles spaced in the direction of lateral load where D is the pile diameter:

| Pile Space | Reduction Factor |
|------------|------------------|
| 8D         | 1.0              |
| 6D         | 0.8              |
| 4D         | 0.5              |
| 3D         | 0.4              |

17. The integrity of on-site soils and new structural fill must be maintained during cold weather conditions. Subgrades should not be allowed to freeze. The naturally in-situ soils are considered moderately to highly frost-susceptible. The Contractor should make every effort to prevent freezing of subgrade soils. If frost penetration occurs, structural fill should be removed and replaced to the depth of the frozen soils. At no time should frozen material be placed as fill.
18. Project specifications should require the Contractor to submit information on their proposed pile driving system for review by the project Structural Engineer and RWG&A before equipment mobilization. The pile driving system should be capable of installing the piles to the specified geotechnical capacity without damaging the piles. Driving stresses should be limited to a maximum compressive stress of 45 kips per square inch for the 50 kips per square inch yield strength steel. The Contractor's submittal should include a wave equation analysis of the proposed driving system to evaluate driving stresses.
19. Planned pile locations should be verified to be clear of any underground construction that could be adversely affected by pile installation.
20. The piles should be driven using a pile hammer with a rated energy of about 8,000 to 15,000 foot-pounds per blow. Higher energy piles may be used if wave equation and dynamic pile analyses demonstrate driving stresses are below allowable driving stresses in the piles. Lower energy piles might be needed near vibration and settlement-sensitive construction.
21. A final penetration resistance of about 3 to 4 blows per inch should be required for the final few inches of driving. If abrupt refusal is encountered, driving may be terminated when penetration is less than ½ inch for five successive blows. These driving criteria would be revised based on the pile hammer proposed by the Contractor and their wave equation analysis.
22. Recommended maximum eccentricity for groups of three or more piles is 3 inches from the design location and 1 inch for single piles and groups of two piles. Piles should be installed as plumb as is practicable. A pile should be considered out of plumb if the inclination is greater than 6 inches in 10 feet for groups of 3 or more piles or 1 inch in 10

feet for single piles and groups of two piles. Pile leads should be fixed at two points to control the vertical alignment of driven piles.

23. The final 5 feet of each pile should be driven in a continuous manner using the same equipment and to approximately the same penetration resistance. The Structural Engineer should provide criteria for the use of pile splices. Vibratory hammer installation isn't recommended for this project.
24. Adequate provisions should be made to observe pile heave for pile groups of three or more. If measurements indicate more than 1/8 inch of heave has occurred during installation of adjacent piles, then heaved piles should be re-driven.

### **6.05 Exterior Ground Floor Slabs and Foundation Drainage**

25. Exterior slabs at building entrances should be pile-supported structural slabs. If some settlement where associated cracking and increased maintenance are tolerable, exterior slabs may be designed as slabs-on-grade using a subgrade modulus of 150 pounds per cubic inch. It is anticipated design and construction details of slabs, including concrete thickness, reinforcing, bedding, control joint depth and spacing, and the vapor retarder type and thickness will be provided by the project Structural Engineer.
26. Exterior slabs at entrances and other locations sensitive to frost action should be underlain by a minimum of 4 feet of underdrain stone. Underdrain stone should consist of State of Maine Department of Transportation, *Standard Specifications Revision of November 2014, 703.22 Underdrain Backfill Material Type C*. Slabs at locations where frost heaving is tolerable should be underlain by a minimum of 18 inches of structural fill. The surrounding area should be pitched to drain away to reduce available moisture for ice and frost lens generation. The underdrain stone should be completely wrapped in filter fabric to prevent the surrounding soil migration into the stone.
27. Perimeter footing drains should be installed around the addition. The drains should be installed at the exterior bottom of pile cap level or at least 18 inches below the adjacent finished floor level, whichever is lower. The drains should consist of perforated pipe bedded in 2 cubic feet of underdrain stone per linear foot. The underdrain stone should be completely wrapped in a filter fabric such as Mirafi 160N. Flow from the foundation drains should be conveyed by gravity to surface drainage features or storm drains that will be free-flowing at all times and under all conditions.
28. Multiple outlets should be provided to not depend on a single flow path. Surface water drainage systems, including roof drains, stormwater, and/or floor drains should not be connected to the foundation drains or underslab drains. Surface water drainage features, including roof drains, pipes, catch basins, manholes, drip edges, infiltration trenches, and basins should be isolated and direct water away from foundation drainage at all times and locations.

If an infiltration drip edge is planned adjacent to below-grade spaces, the trench should be lined with impervious materials to hydraulically isolate the trench and its collection pipe from the surrounding ground. A layer of low permeability soil, such as compacted



silty clay or impervious pavement should be used at ground surface against the building to reduce water infiltration.

### **6.06 Temporary Excavations**

Soils encountered at the project sites consisted of fill, silty sand, and sandy silt. We anticipate foundation and utility excavations can be accomplished using sloped, open-cut techniques. It is also anticipated that dewatering can be accomplished using sumps and open pumping methods.

The Contractor should be aware that slope height, slope inclination, and excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations (e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations). Such regulations are strictly enforced, and if they are not followed, the Owner, Contractor, and/or earthwork and utility subcontractors could be liable for substantial penalties.

As a safety measure, it is recommended that all vehicles and spoil piles be kept at a minimum lateral distance from the top of excavations equal to no less than 100 percent of the slope height. Exposed slope faces should be protected against the elements.

### **6.07 Geotechnical Observation**

The geotechnical recommendations provided as the basis for design of this project were developed using a limited number of observations and tests. The Owner should be sensitive to the potential need for adjustment in the field. We recommend that the Owner retain RWG&A to observe geotechnical construction aspects of the project. These services should include observing general compliance with the design concepts, specifications and recommendations, and assisting in development of design changes should subsurface conditions differ from those anticipated before the start of construction. Observation improves the likelihood of the design intent being carried out during construction. In addition, it allows RWG&A to confirm its design recommendations. For this project, geotechnical observation of the following aspects is recommended:

- Pile installation
- Structural fill placement and compaction
- Preparation of foundation subgrades

In addition to geotechnical observation, RWG&A can also provide full-service construction inspection and materials testing. This would include soils, portland cement and asphaltic concrete, structural steel and welding inspections, destructive and non-destructive testing, and special inspection services in fulfillment of building code requirements.

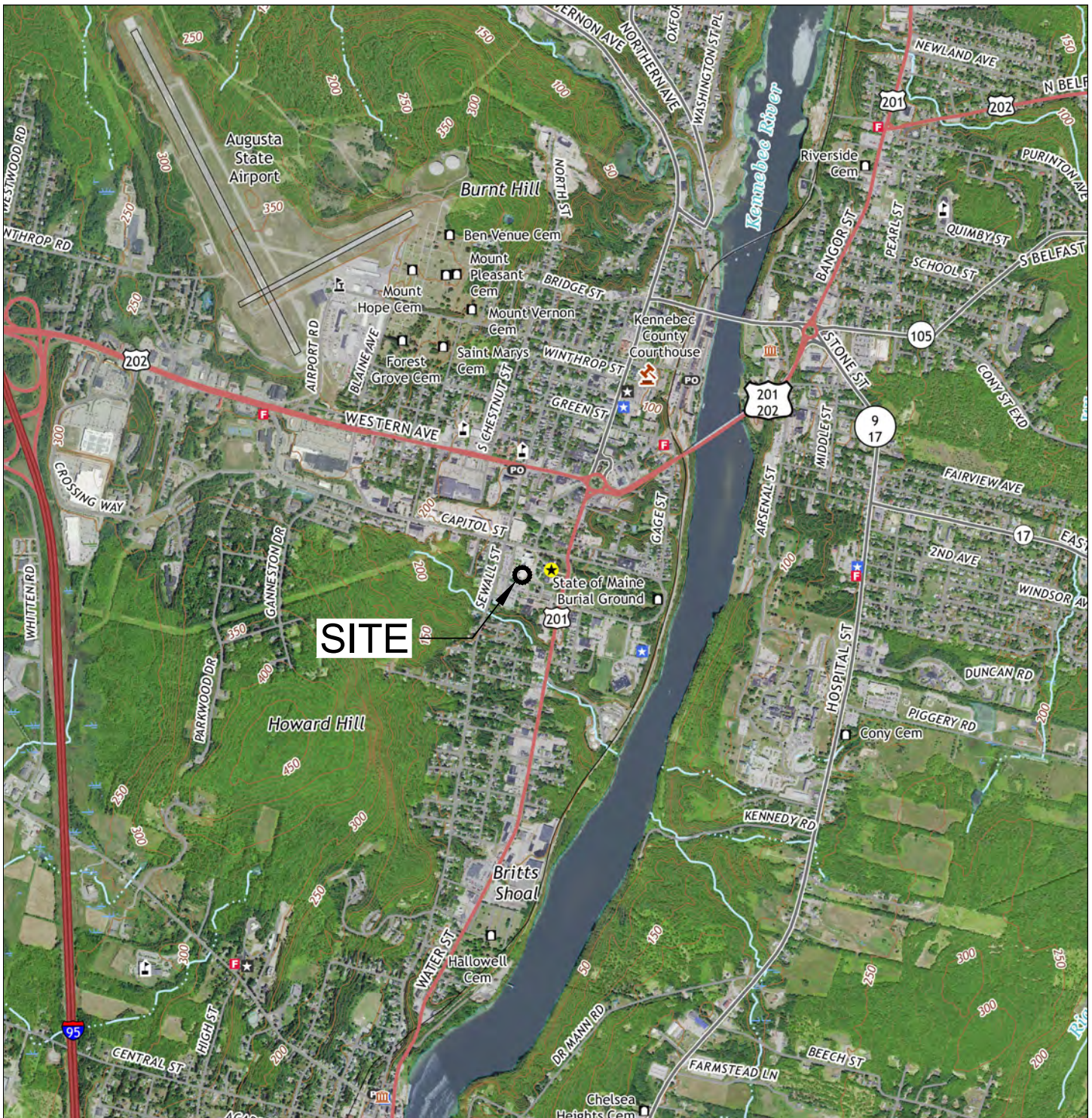
## **7.0 CLOSURE**

This report has been prepared for specific application to design and construction of the proposed addition to the Burton M. Cross Building at 11 Sewall Street in Augusta, Maine, for the exclusive use of Oak Point Associates. This work has been completed in accordance with

generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made. If any changes are made in the nature, design, or location of the proposed construction, the conclusions and recommendations of this report should be reviewed by RWG&A.

The recommendations presented are based on the results of widely spaced explorations. The nature of variations between the explorations may not become evident until construction has begun. If variations are encountered, it will be necessary for RWG&A to re-evaluate the recommendations presented in this report. RWG&A requests an opportunity for a general review of the final design and specifications to determine that earthwork and foundation recommendations have been interpreted in the way they were intended.





0 2000 3000 4000

SCALE, FEET

SOURCE:  
USGS 7.5-MINUTE TOPOGRAPHIC QUADRANGLE OF  
AUGUSTA, ME, DATED 2021.

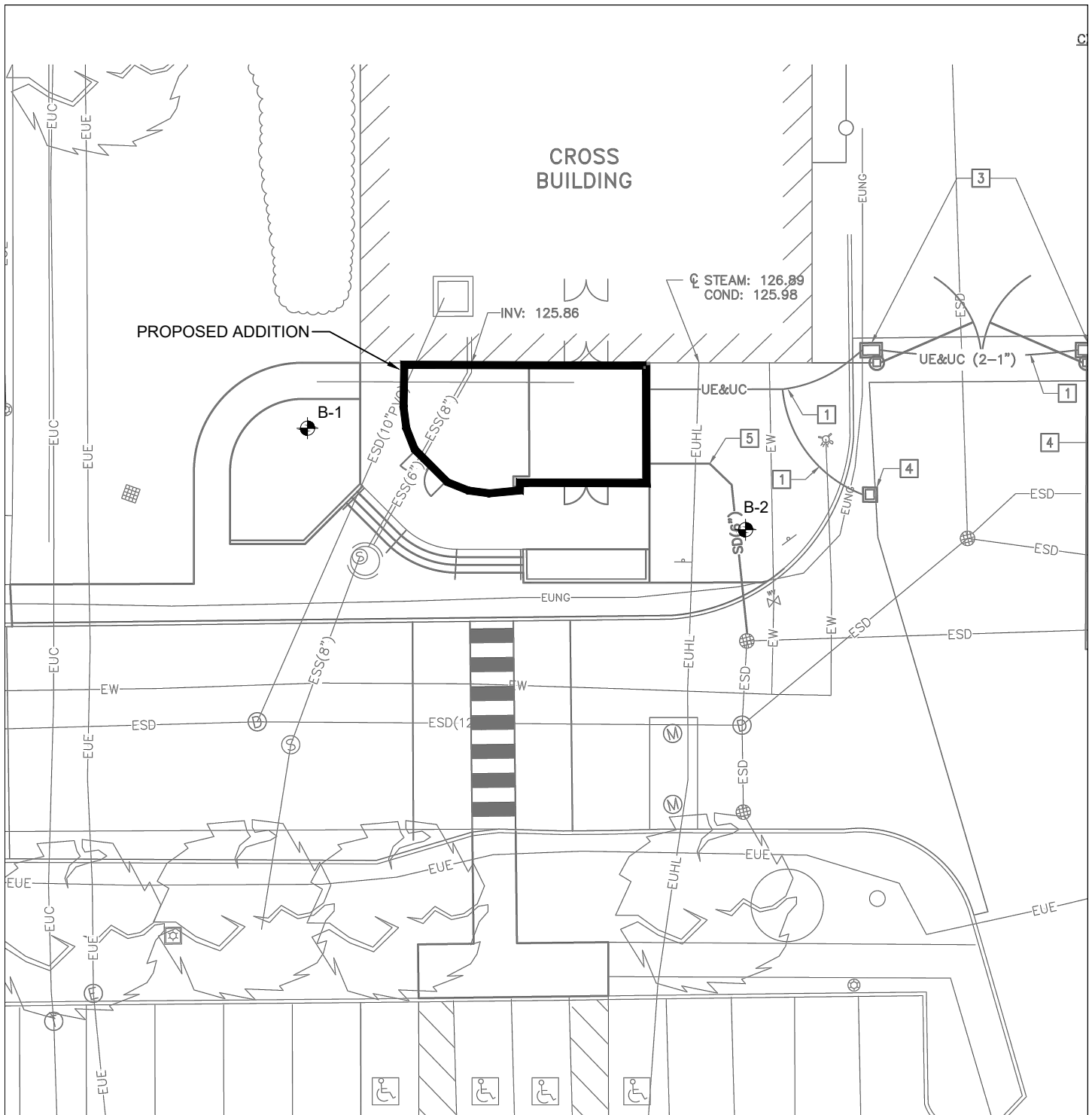
FIGURE 1  
LOCUS MAP  
GEOTECHNICAL ENGINEERING EVALUATION  
PROPOSED ONE-STORY ADDITION  
AUGUSTA, MAINE


AUGUSTA 2024

PROJECT NO. 0767-175-24





**LEGEND:**

 B-1 APPROXIMATE LOCATION OF SOIL BORING DRILLED 21 JUNE 2024.



0 20 30 40  
SCALE, FEET

**FIGURE 2**  
**EXPLORATION LOCATION PLAN**  
**GEOTECHNICAL ENGINEERING EVALUATION**  
**PROPOSED ONE-STORY ADDITION**  
**AUGUSTA, MAINE**

AUGUST 2024

PROJECT NO. 0767-175-24

**SOURCE:**  
DRAWING NO. CU101, TITLED "UTILITY PLAN", PREPARED BY OAK  
POINT ASSOCIATES, DATED 8/21/2024, MARKED "50 % SUBMISSION".



**APPENDIX A**  
**LIMITATIONS**

Geotechnical Engineering Evaluation  
Proposed One-Story Addition  
Burton M. Cross Building  
Augusta, Maine

## **R.W. Gillespie & Associates, Inc.**

### **LIMITATIONS**

This evaluation has been limited considering the geotechnical engineering aspects of the proposed addition to the Burton M. Cross Building at 11 Sewall Street in Augusta, Maine. The primary purpose of the evaluation was to obtain information regarding subsurface conditions and soil properties to base recommendations for design and construction of building foundations and ground floor slabs and to determine site seismic characteristics for use in building design. This report identifies construction considerations intended solely to assist engineers that will design the project and monitor its construction, and not to the benefit of others, including but not limited to the Contractor. This report is neither a technical specification nor intended to be used for bidding or building the project.

This geotechnical evaluation might also aid contractors responsible for constructing the proposed buildings. However, the recommendations and comments in this report are not intended to be instructions or directives to the project Contractors. The project Contractors must evaluate construction issues encountered in the work based on their experience with similar projects, considering their methods and procedures.

RWG&A has not considered the construction from a worker safety perspective. Construction safety is the project Contractor's responsibility, who is solely responsible for the means, methods, and sequencing of construction operations. RWG&A is providing this information as a service to Oak Point Associates. Under no circumstances should this information be interpreted to mean that RWG&A, Oak Point Associates, and/or the Owner assume responsibility for construction site safety or the Contractor's activities; such responsibility is not implied and should not be inferred.

RWG&A's services exclude:

- Any environmental site assessment relative to oil and hazardous materials or evidence of a potential release or threat of oil or hazardous materials on, below, or around the site. (Note: any statement in this report, or on the exploration logs, regarding odors or unusual or suspicious conditions is for informational purposes only and is not intended to constitute an environmental assessment.)
- Any service to investigate or detect the presence of mold or other biological contaminants or any service designed or intended to prevent or lower the risk of an infestation of mold or other biological contaminants (MOBC infestation).
- Any service to investigate or detect the presence of potentially hazardous subsurface vapor sources or any service designed or intended to prevent or lower the risk of vapor intrusion.

**APPENDIX B**  
**EXPLORATION LOGS**

Geotechnical Engineering Evaluation  
Proposed One-Story Addition  
Burton M. Cross Building  
Augusta, Maine

RWG&A, Inc. soil descriptions are based on the following criteria. Descriptive terminology is used to denote the grain size and percentage of each component. The soil descriptions are based on visual-manual classification procedures, Standard Penetration Test results, and the results of laboratory testing on selected soil samples, where available. The Unified Soil Classification Group Symbol will be indicated in capital letters.

#### COMPONENT DEFINITIONS BY GRADATION SIEVE LIMITS

| Materials | Definitions  | Fractions                | Upper   | Lower                                      |
|-----------|--|--------------------------|---|--|
| Boulders  | Material too large to pass through an opening 12 in. square.   |                          |   |  |
| Cobbles   | Material passing through a 12 in. opening and retained on the 3 in. sieve.   |                          |   |  |
| Gravel    | Material passing the 3 in. sieve and retained on 1/4" (No. 4 sieve).   | Coarse<br>Fine           | 3 in.<br>3/4 in.                                | 3/4 in.<br>1/4 in.                         |
| Sand      | Material passing the No. 4 sieve and retained on the No. 200 sieve.  | Coarse<br>Medium<br>Fine | No. 4 (1/4")<br>No. 10 (1/8")<br>No. 40 (1/32") | No. 10 (1/8")<br>No. 40 (1/32")<br>No. 200 |
| Silt      | Material passing the No. 200 sieve which is usually non-plastic in character and exhibits little or no strength when air dried.  |                          | No. 200   |  |
| Clay      | Material passing the No. 200 sieve which can also be made to exhibit plasticity within a certain range of moisture contents and which exhibits considerable strength when air dried. |                          | No. 200   |  |

#### SOIL DESCRIPTION

##### General

Soils are described as to the Unified Soil Classification Systems Group Symbol, density or consistency, color, grain size distribution and other pertinent properties such as plasticity and dry strength. The RWG&A order of descriptors is as follows:

1. USCS Group Name and Symbol, or Fill
2. Density or Consistency
3. Moisture
4. Grain Size & Constituent percentages
5. Other pertinent descriptors
6. Color

#### DESCRIPTIVE TERMINOLOGY DENOTING COMPONENT PROPORTIONS

| <u>Descriptive Terms</u>           | <u>Range of Proportions</u>  |
|------------------------------------|--|
| Noun (major component)             | ≥50%   |
| Adjective (secondary component)    | 20 - 50%   |
| Some (third component)             | 25 - 45%   |
| Little (second or third component) | 15 - 25%   |
| Few (second or third component)    | 5 - 15%  |
| Trace                              | 0 - 5%   |
| With                               | Amount of component not determined. Used as a conjunction only. Does not indicate component percentile |

#### OTHER DESCRIPTIVE TERMS

Where appropriate, geological classifications are also used (Glacial Till, etc.)

#### TYPICAL DESCRIPTIONS

SAND WITH SILT (SP-SM): Medium dense, moist, coarse to medium sand, few silt, brown.

FILL; Loose, dry, fine sand, some gravel and silt, with brick and concrete fragments, dark brown.

SILTY CLAY (CL); Very stiff, moist, silty clay, olive-brown.

| <u>DENSITY OR CONSISTENCY OF SOILS</u>   |  |                                       |
|--|--|---------------------------------------|
| <u>COHESIVE SOILS</u>  |  |                                       |
| <u>Consistency of Cohesive Soils</u>   | <u>Standard Penetration Test (Blows Per Foot) (N)</u>  | <u>Undrained Shear Strength (TSF)</u> |
| Very Soft  | 0 - 2  | Below 0.13 (250 psf)                  |
| Soft   | 2 - 4  | 0.13 to 0.25 (to 500 psf)             |
| Medium   | 4 - 8  | 0.25 to 0.5 (to 1,000 psf)            |
| Stiff  | 8 - 15   | 0.5 to 1.0 (to 2,000 psf)             |
| Very Stiff   | 15 - 30  | 1.0 to 2.0 (to 4,000 psf)             |
| Hard   | Over 30  | over 2.0 (over 4,000 psf)             |
| Consistency of cohesive soils is based upon field vane shear, torvane, or pocket penetrometer, or laboratory vane shear or Unconsolidated-Undrained Triaxial Compression tests. Consistency of cohesive soils is based upon the Standard Penetration test when no other data is available.   |  |                                       |
| <u>COHESIONLESS SOILS</u>  |  |                                       |
| <u>Density of Cohesionless Soils</u>   | <u>Standard Penetration Test (Blows per Foot) (in)</u> |                                       |
| Very Loose   | 0 - 4  |                                       |
| Loose  | 4 - 10   |                                       |
| Medium Dense   | 10 - 30  |                                       |
| Dense  | 30 - 50  |                                       |
| Very Dense   | over 50  |                                       |
| <u>PENETRATION RESISTANCE</u>  |  |                                       |
| <u>STANDARD PENETRATION TEST (ASTM D1586)</u> - a 2.0-inch diameter, 1-3/8 inch inside diameter split barrel sample is driven into soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The total number of blows required for penetration from 6 to 18 inches is the Standard Penetration Resistance (N). |  |                                       |
| <u>COBBLES AND BOULDERS</u>  |  |                                       |
| The percentage of cobbles and boulders is estimated visually where possible.   |  |                                       |
| <u>Descriptive Term</u>  | <u>Estimated Percentage</u>                            |                                       |
| Very Few   | 0 - 10%  |                                       |
| Few  | 10 - 25%   |                                       |
| Common   | 25 - 40%   |                                       |
| Numerous   | 40 - 50%   |                                       |
| If the percentage cannot be determined, as in a typical test boring, then use “with” to indicate the presence of cobbles and/or boulders. (i.e., gravelly sand with cobbles and boulders).   |  |                                       |
| <u>FILLS</u>   |  |                                       |
| The following terminology is used to denote size range of man-made materials within fill deposits:   |  |                                       |
| <u>Size Range</u>  | <u>Comparative Soil Terms</u>                          |                                       |
| <No. 200 Sieve   | Silt - size  |                                       |
| No. 200 to 1/4 in.   | Sand - size  |                                       |
| 1/4 in. to 3 in.   | Gravel - size  |                                       |
| 3 in. to 12 in.  | Cobble - size  |                                       |
| >12 in.  | Boulder - size   |                                       |
| <u>SUPPLEMENTAL SOIL DESCRIPTION TERMINOLOGY</u>   |  |                                       |
| <u>Term</u>  | <u>Example</u>   |                                       |
| Seam   | Typically 1/16 to 1/2 inch thick                       | 1/4 inch sand seams                   |
| Layer  | Greater than 1/2 inch thick                            | 2-inch sand layers                    |
| Occasional   | One or less per foot of thickness                      |                                       |
| Frequent   | More than one per foot of thickness                    |                                       |
| Interbedded  | Alternating soil layers of different composition       |                                       |
| Varved   | Alternating thin seams of silt and clay                |                                       |
| Mottled  | Variations in color                                    |                                       |





**R.W. Gillespie  
& Associates**

- Geotechnical Engineering
- Environmental Consulting
- Materials Testing Services

Boring Log: B-1

Total Depth (ft): 25.6

Sheet 1 of 1

Project Name: Proposed One-Story Addition - Augusta  
RWG&A Project No. 0767-175-24  
Location: Augusta, Maine  
Client: Oak Point Associates  
RWG&A Representative: Tom Snow  
Boring Location: See Exploration Location Plan  
Boring Abandonment Method: Backfill with cuttings  
Observed Water Depth: 20'

Drilling Co.: Northern Test Boring  
Drill Rig: Diedrich D-50 Small Rubber Track  
Driller Rep.: Mike Nadeau  
Date Started: 06/21/24  
Date Completed: 06/21/24  
Surface Elevation: 131.5 Feet  
Drilling Method: 2 1/4" HSA  
Casing Type:

| DEPTH, FT. | SYMBOL | SAMPLES | DESCRIPTION OF MATERIAL   | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N VALUE | MOISTURE CONTENT % | LAB TESTS |
|------------|--------|---------|---|----------------------|--------------|-------------|--------------------|-----------|
| 0          |        | S-1     | FILL; Topsoil and Organic Material (4 inches).  | 14                   | 3            | 10          |                    |           |
|            |        |         | FILL; Dry, fine sand, few silt, tan.  |                      | 4            |             |                    |           |
|            |        | S-2     | FILL; Asphalt.  | 12                   | 6            | 9           |                    |           |
|            |        |         | SILTY SAND to SANDY SILT (SM/ML); Loose to medium dense, moist, coarse to fine sand, some silt, trace fine gravel, gray-brown to loose, moist, silt, some coarse to fine sand, trace fine gravel, gray-brown. |                      | 8            |             |                    |           |
| 5          |        | S-3     |   | 16                   | 12           | 5           | 21.2               | GS        |
|            |        | S-4     |   | 15                   | 3            | 5           |                    | MC        |
|            |        |         |   |                      | 6            |             |                    |           |
| 10         |        | S-5     | With silty seams.   | 16                   | 7            | 5           |                    |           |
|            |        |         |   |                      | 3            |             |                    |           |
|            |        |         |   |                      | 2            |             |                    |           |
| 15         |        | S-6     |   | 15                   | 2            | 7           | 23.7               | MC        |
|            |        |         |   |                      | 3            |             |                    |           |
|            |        |         |   |                      | 4            |             |                    |           |
|            |        |         |   |                      | 5            |             |                    |           |
| 20         |        | S-7     | SILTY SAND WITH GRAVEL (SM); Medium dense, wet, coarse to fine sand, some silt, little fine gravel, few small white shell fragments, dark gray.   | 20                   | 4            | 10          |                    |           |
|            |        |         |   |                      | 5            |             |                    |           |
|            |        |         |   |                      | 5            |             |                    |           |
|            |        |         |   |                      | 4            |             |                    |           |
| 25         |        | S-8     | Bottom of exploration at 25.6'; Auger refusal on cobble, boulder, or bedrock.   | 6                    | 10           |             |                    |           |
|            |        |         |   |                      | 50/1"        |             |                    |           |
| 30         |        |         |   |                      |              |             |                    |           |

Notes:



**R.W. Gillespie  
& Associates**

- Geotechnical Engineering
- Environmental Consulting
- Materials Testing Services

Boring Log: B-2

Total Depth (ft): 17.3

Sheet 1 of 1

Project Name: Proposed One-Story Addition - Augusta  
RWG&A Project No. 0767-175-24  
Location: Augusta, Maine  
Client: Oak Point Associates  
RWG&A Representative: Tom Snow  
Boring Location: See Exploration Location Plan  
Boring Abandonment Method: Backfill with cuttings  
Observed Water Depth: 12'

Drilling Co.: Northern Test Boring  
Drill Rig: Diedrich D-50 Small Rubber Track  
Driller Rep.: Mike Nadeau  
Date Started: 06/21/24  
Date Completed: 06/21/24  
Surface Elevation: 131 Feet  
Drilling Method: 2 1/4" HSA  
Casing Type:

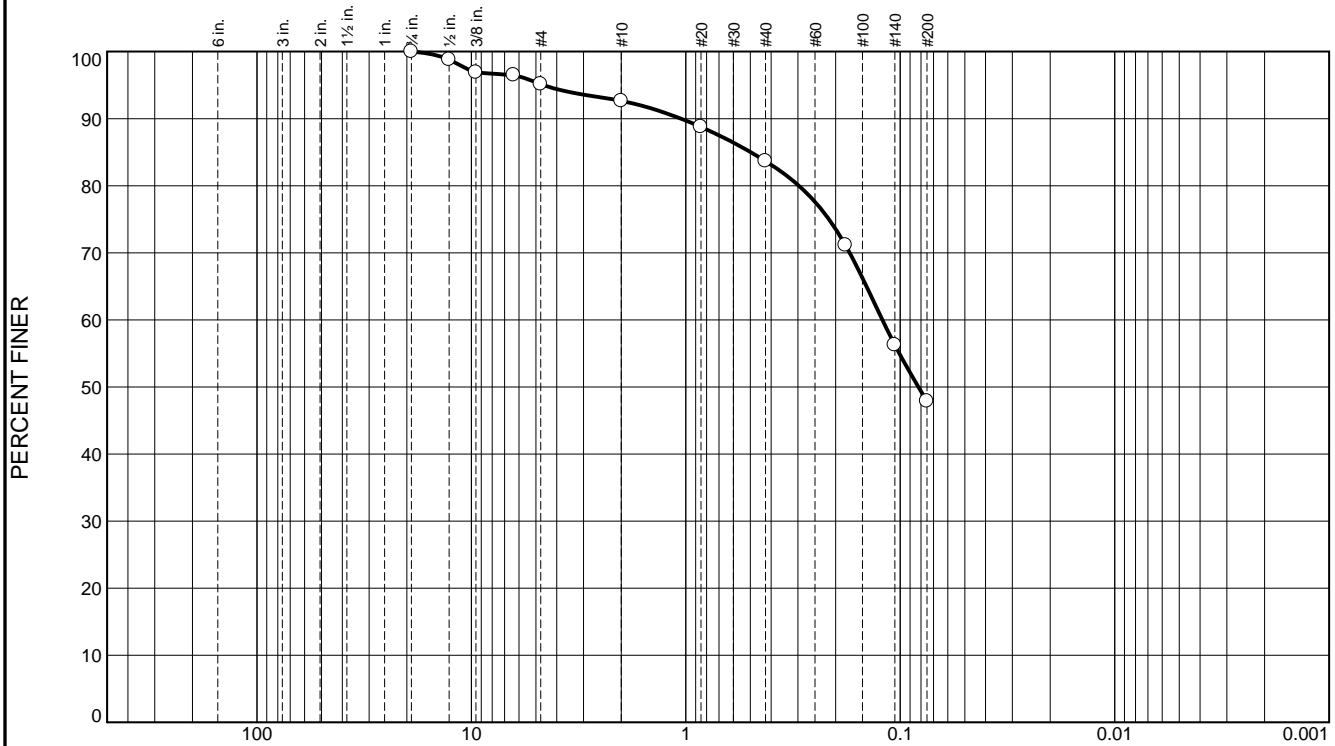
| DEPTH, FT. | SYMBOL | SAMPLES | DESCRIPTION OF MATERIAL   | SAMPLE RECOVERY, IN. | BLOWS PER 6" | SPT-N VALUE | MOISTURE CONTENT % | LAB TESTS |
|------------|--------|---------|---|----------------------|--------------|-------------|--------------------|-----------|
| 0          |        | S-1     | FILL; Topsoil and Organic Material (4 inches).  | 14                   | 3            | 12          |                    |           |
|            |        | S-2     | FILL; Silty sand, dry, coarse to fine sand, little silt, trace fine gravel, tan.  | 15                   | 5            |             | 5.3                | GS        |
|            |        |         |   |                      | 7            | 8           |                    | MC        |
|            |        |         |   |                      | 4            |             |                    |           |
|            |        |         |   |                      | 4            |             |                    |           |
| 5          |        | S-3     |   | 15                   | 4            | 4           |                    |           |
|            |        |         |   |                      | 2            |             |                    |           |
|            |        | S-4     | FILL; Some gravel.  | 10                   | 2            | 8           |                    |           |
|            |        |         |   |                      | 3            |             |                    |           |
|            |        |         | SANDY SILT (ML); Medium dense, moist to wet, silt, some medium to fine sand, gray-brown.                                |                      | 3            |             |                    |           |
| 10         |        | S-5     |   | 18                   | 5            | 11          | 20.5               | GS        |
|            |        |         |   |                      | 5            |             |                    | MC        |
|            |        |         |   |                      | 5            |             |                    |           |
|            |        |         | Auger action indicates denser strata and possible cobbles (13'-14.5').  |                      | 6            |             |                    |           |
| 15         |        | S-6     | SILTY SAND WITH GRAVEL (SM); Medium dense, moist, coarse to fine sand, little silt, little gravel, brown to gray-brown. | 15                   | 3            | 19          |                    |           |
|            |        |         |   |                      | 8            |             |                    |           |
|            |        |         |   |                      | 11           |             |                    |           |
|            |        |         |   |                      | 3            |             |                    |           |
|            |        |         | Bottom of exploration at 17.3'; Auger refusal on cobble, boulder, or bedrock.   |                      |              |             |                    |           |
| 20         |        |         |   |                      |              |             |                    |           |
|            |        |         |   |                      |              |             |                    |           |
| 25         |        |         |   |                      |              |             |                    |           |
|            |        |         |   |                      |              |             |                    |           |
| 30         |        |         |   |                      |              |             |                    |           |

Notes:

**APPENDIX C**  
**LABORATORY TEST RESULTS**

Geotechnical Engineering Evaluation  
Proposed One-Story Addition  
Burton M. Cross Building  
Augusta, Maine

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 0.0      | 4.9  | 2.4    | 9.0    | 35.8 | 47.9    |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 3/4"       | 100.0         |                |              |
| 1/2"       | 98.8          |                |              |
| 3/8"       | 96.9          |                |              |
| 1/4"       | 96.5          |                |              |
| #4         | 95.1          |                |              |
| #10        | 92.7          |                |              |
| #20        | 88.8          |                |              |
| #40        | 83.7          |                |              |
| #80        | 71.1          |                |              |
| #140       | 56.2          |                |              |
| #200       | 47.9          |                |              |

\* (no specification provided)

## Soil Description

silty sand

## Atterberg Limits

PL=

LL=

PI=

## Coefficients

D<sub>90</sub>= 1.0541

D<sub>85</sub>= 0.4982

D<sub>60</sub>= 0.1211

D<sub>50</sub>= 0.0823

D<sub>30</sub>=

D<sub>15</sub>=

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Classification

USCS= SM

AASHTO= A-4(0)

## Remarks

Moisture Content: 21.2%

Location: B-1

Sample Number: S-3

Depth: 5-7'

Date: 07/18/2024

**R.W. Gillespie  
& Associates, Inc.  
Biddeford, Maine**

Client: Oak Point Associates

Project: Proposed One-Story Addition - Augusta,  
Augusta, ME

Project No: 0767-175

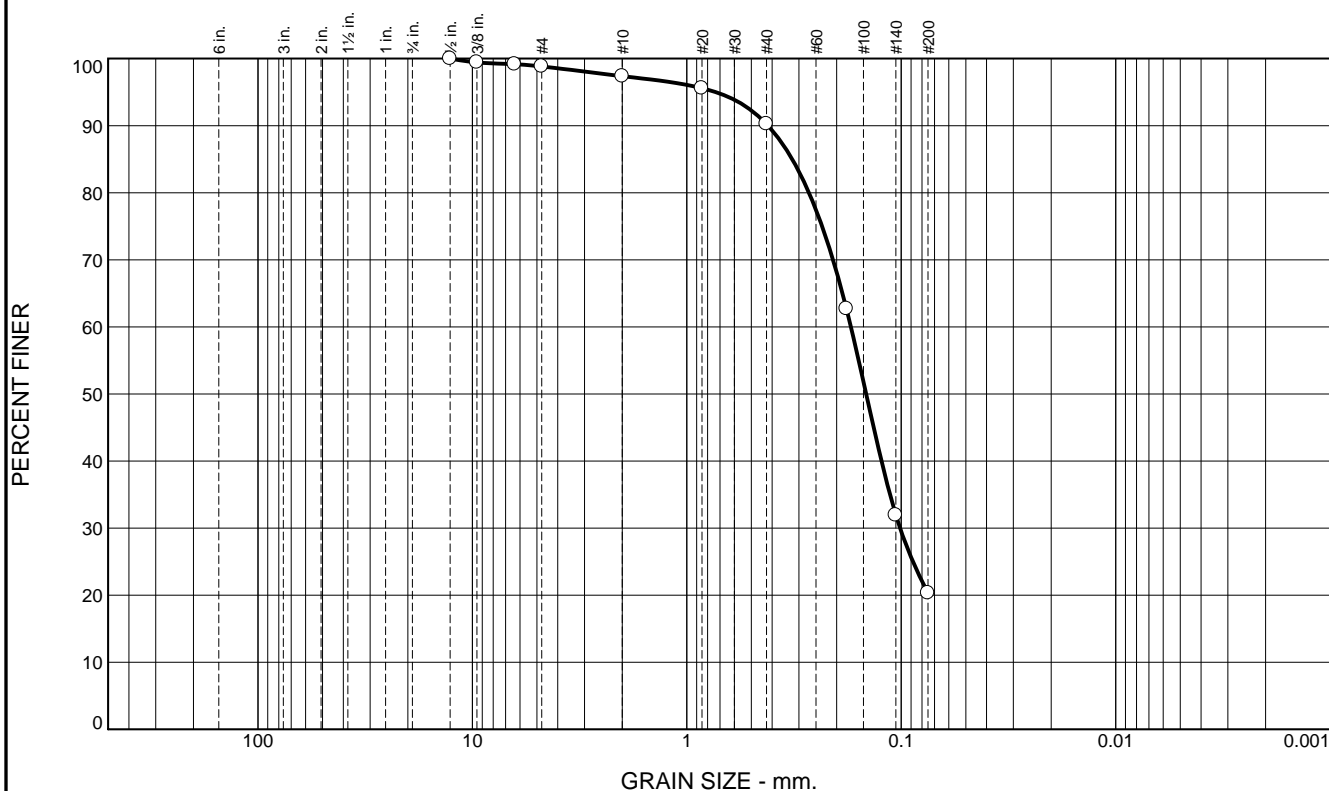
Lab No. 18098-01

Tested By: MES/CAG

Checked By: MTG

MTG

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 0.0      | 1.2  | 1.4    | 7.2    | 69.9 | 20.3    |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 1/2"       | 100.0         |                |              |
| 3/8"       | 99.4          |                |              |
| 1/4"       | 99.2          |                |              |
| #4         | 98.8          |                |              |
| #10        | 97.4          |                |              |
| #20        | 95.6          |                |              |
| #40        | 90.2          |                |              |
| #80        | 62.7          |                |              |
| #140       | 31.9          |                |              |
| #200       | 20.3          |                |              |

\* (no specification provided)

## Soil Description

silty sand

## Atterberg Limits

PL=

LL=

PI=

## Coefficients

D<sub>90</sub>= 0.4182

D<sub>85</sub>= 0.3223

D<sub>60</sub>= 0.1717

D<sub>50</sub>= 0.1457

D<sub>30</sub>= 0.1014

D<sub>15</sub>=

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Classification

USCS= SM

AASHTO= A-2-4(0)

## Remarks

Moisture Content: 5.3%

Location: B-2  
Sample Number: S-2

Depth: 2-4'

Date: 07/18/2024

**R.W. Gillespie  
& Associates, Inc.  
Biddeford, Maine**

Client: Oak Point Associates  
Project: Proposed One-Story Addition - Augusta, ME

Project No: 0767-175

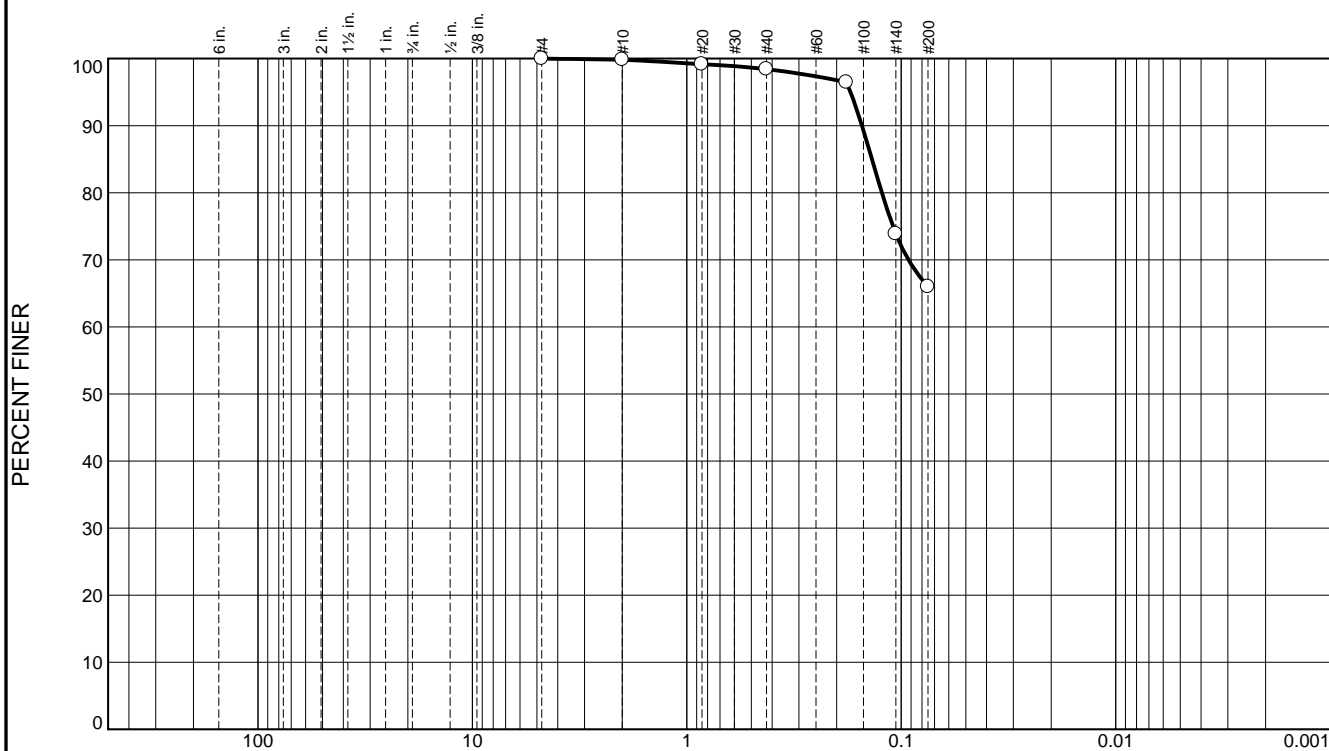
Lab No. 18098-02

Tested By: CAG/MES

Checked By: MTG

MTG

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 0.0      | 0.0  | 0.2    | 1.4    | 32.4 | 66.0    |      |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| #4         | 100.0         |                |              |
| #10        | 99.8          |                |              |
| #20        | 99.1          |                |              |
| #40        | 98.4          |                |              |
| #80        | 96.5          |                |              |
| #140       | 73.9          |                |              |
| #200       | 66.0          |                |              |

\* (no specification provided)

## Soil Description

sandy silt

## Atterberg Limits

PL=

LL=

PI=

## Coefficients

D<sub>90</sub>= 0.1525

D<sub>85</sub>= 0.1370

D<sub>60</sub>=

D<sub>50</sub>=

D<sub>30</sub>=

D<sub>15</sub>=

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Classification

USCS= ML

AASHTO= A-4(0)

## Remarks

Moisture Content: 20.5%

Location: B-2

Sample Number: S-5

Depth: 10-12'

Date: 07/18/2024

**R.W. Gillespie  
& Associates, Inc.  
Biddeford, Maine**

Client: Oak Point Associates

Project: Proposed One-Story Addition - Augusta  
Augusta, ME

Project No: 0767-175

Lab No. 18098-03

Tested By: CAG/MES

Checked By: MTG

MTG

SECURITY SCREENING CENTERS  
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AUGUSTA, MAINE

SECTION 316216 - STEEL PILES

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 steel H piles.

1.3 UNIT PRICES

- A. Contract Sum: Base Contract Sum on number and dimensions of piles indicated from tip to cutoff, plus not less than 12 inches of overlength for cutting piles at cutoff elevations.
- B. Work of this Section is affected as follows:
  - 1. Additional payment for number of piles in excess of that indicated, and credit for number of piles less than that indicated, is calculated at unit prices stated in the Contract.
  - 2. Unit prices include labor, materials, tools, equipment, and incidentals for furnishing, driving, cutting off, capping, and disposing of cutoffs.
  - 3. Test piles that become part of permanent foundation system are considered as an integral part of the Work.
  - 4. No payment is made for rejected piles, including piles driven out of tolerance, defective piles, or piles damaged during handling or driving.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Shop Drawings: For steel H piles. Show fabrication and installation details for piles, including details of driving points, splices, and pile caps.
  - 1. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

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2. Include arrangement of static pile reaction frame, test and anchor piles, equipment, and instrumentation. Submit structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For Installer and testing agency.
- C. Welding certificates.
- D. Mill Test Reports: For steel H piles, steel castings, and steel plate, signed by manufacturer.
- E. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and, type, size, and properties of hammer cushion.
- F. Static Pile Test Reports: Submit within three days of completing each test.
- G. Pile-Driving Records: Submit within three days of driving each pile.
- H. Certified Piles Survey: Submit within seven days of pile driving completion.
- I. Field quality-control reports.
- J. Preconstruction Photographs: Photographs or video of existing conditions of adjacent construction. Submit before the Work begins.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
  1. Installer's responsibility includes engaging a qualified professional engineer to prepare pile-driving records.
- B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.8 PRECONSTRUCTION TESTING

- A. General: Static pile tests are used to verify driving criteria and pile lengths and to confirm allowable load of piles.
  1. Furnish test piles 60 inches longer than production piles.
  2. Determination of actual length of piles is based on results of static pile tests.



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- B. Pile Tests: Arrange and perform the following pile tests:
  - 1. Axial Compressive Static Load Test: ASTM D1143/D1143M. Procedure A, Quick Test.
    - a. Procedure B, Maintained Test.
  - 2. Axial Tension Static Load Test: ASTM D3689.
  - 3. Lateral Load Test: ASTM D3966.
- C. Equip each test pile with two telltale rods, according to ASTM D1143/D1143M, for measuring deformation during load test.
- D. Provide pile reaction frame, anchor piles, equipment, and instrumentation with enough reaction capacity to perform tests. Notify Architect at least 48 hours in advance of performing tests. On completion of testing, remove testing structure, anchor piles, equipment, and instrumentation.
  - 1. Allow a minimum of seven days to elapse after driving test piles before starting pile testing.
  - 2. Number of Test Piles: One pile.
- E. Drive test piles at locations indicated to the minimum penetration or driving resistance indicated. Use test piles identical to those required for Project, and drive with appropriate pile-driving equipment operating at rated driving energy to be used in driving permanent piles.
  - 1. Pile Design Load: As indicated.
- F. Approval Criteria: Allowable load shall be the load acting on the test pile when the lesser of the following criteria are met, divided by a factor of safety of 2:
  - 1. Net settlement, after deducting rebound, of not more than 0.01 inch/ton of test load.
  - 2. Total settlement exceeds the pile elastic compression by 0.15 inch, plus 1.0 percent of the tip diagonal dimension.
  - 3. A plunging failure or sharp break in the load settlement curve.
- G. Test Pile-Driving Records: Prepare driving records for each test pile, compiled and attested to by a qualified professional engineer. Include same data as required for driving records of permanent piles.
- H. Test piles that comply with requirements, including location tolerances, may be used on Project.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver piles to Project site in such quantities and at such times to ensure continuity of installation. Handle and store piles at Project site to prevent buckling or physical damage.

#### 1.10 FIELD CONDITIONS

- A. Protect structures, underground utilities, and other construction from damage caused by pile driving.

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- B. Site Information: A geotechnical report has been prepared for this Project and is referenced elsewhere in the Project Manual for information only.
- C. Preconstruction Photographs: Inventory and record the condition of adjacent structures, underground utilities, and other construction. Document conditions that might be misconstrued as damage caused by pile driving. Comply with Section 013233 "Photographic Documentation."

## PART 2 - PRODUCTS

### 2.1 STEEL H PILES

- A. High-Strength, Low-Alloy, Columbium-Vanadium Structural Steel: ASTM A572/A572M, Grade 50.

### 2.2 PILE ACCESSORIES

- A. Driving Points: Manufacturer's standard one-piece driving point, fabricated from steel castings as follows to provide full bearing of web and flange of pile tip:
  - 1. Carbon-Steel Castings: ASTM A27/A27M, Grade 65-35, heat treated or Grade N1.
  - 2. High-Strength Steel Castings: ASTM A148/A148M, Grade 80-40 or Grade 90-60.
- B. Splice Unit: Manufacturer's standard splice unit, fabricated from two connected steel plates, of same material as steel H pile or material of equal strength, shaped to encase web and part of each flange.

### 2.3 FABRICATION

- A. Fabricate and assemble piles in shop to greatest extent possible.
- B. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch intervals; label the distance from pile tip at 60-inch intervals. Maintain markings on piles until driven.
- C. Fabricate full-length piles to eliminate splicing during driving, with ends square.
- D. Fabricate full-length piles by splicing lengths of steel H pile together. Accurately mill meeting ends of piles and bevel for welding. Maintain axial alignment of pile lengths. Maintain structural properties of pile across splice.
  - 1. Splice Units: Notch web of pile, fit splice unit into position, and weld according to manufacturer's written instructions and AWS D1.1/D1.1M for procedures, appearance and quality of welds, and methods used in correcting welding work.
  - 2. Continuously Welded Splices: Splice piles by continuously welding according to AWS D1.1/D1.1M for procedures, appearance and quality of welds, and methods used in correcting welding work.
  - 3. Splice piles during fabrication or field installation.

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- E. Fit and weld driving points to tip of pile according to manufacturer's written instructions and AWS D1.1/D1.1M for procedures, appearance and quality of welds, and methods used in correcting welding work.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Site Conditions: Do not start pile-driving operations until earthwork fills have been completed or excavations have reached an elevation of 6 to 12 inches above bottom of grade beam or pile cap.

#### 3.2 DRIVING EQUIPMENT

- A. Pile Hammer: Air-, steam-, hydraulic-, or diesel-powered type capable of consistently delivering adequate peak-force duration and magnitude to develop the ultimate capacity required for type and size of pile driven and character of subsurface material anticipated.
- B. Hammer Cushions and Driving Caps: Between hammer and top of pile, provide hammer cushion and steel driving cap as recommended by hammer manufacturer and as required to drive pile without damage.
- C. Leads: Use fixed, semifixed, or hanging-type pile-driver leads that hold the full length of pile firmly in position and in axial alignment with hammer.

#### 3.3 DRIVING PILES

- A. General: Continuously drive piles to elevations or penetration resistance indicated or established by static load testing of piles. Establish and maintain axial alignment of leads and piles before and during driving.
- B. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.
- C. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:
  - 1. Location: 2 inches from location indicated after initial driving, and 3 inches after pile driving is completed.
  - 2. Plumb: Maintain 1 inch in 48 inches from vertical, or a maximum of 3 inches, measured when pile is aboveground in leads.
  - 3. Batter Angle: Maximum 1 inch in 48 inches from required angle, measured when pile is aboveground in leads.
- D. Withdraw damaged or defective piles and piles that exceed driving tolerances, and install new piles within driving tolerances.

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1. Fill holes left by withdrawn piles using cohesionless soil material such as gravel, broken stone, and gravel-sand mixtures. Place and compact in lifts not exceeding 72 inches.
  2. Fill holes left by withdrawn piles as directed by Architect.
- E. Abandon and cut off rejected piles as directed by Architect. Leave rejected piles in place, and install new piles in locations as directed by Architect.
- F. Cut off tops of driven piles square with pile axis and at elevations indicated.
- G. Pile-Driving Records: Maintain accurate driving records for each pile, compiled and attested to by a qualified professional engineer. Include the following data:
1. Project name and number.
  2. Name of Contractor.
  3. Pile location in pile group and designation of pile group.
  4. Sequence of driving in pile group.
  5. Pile dimensions.
  6. Ground elevation.
  7. Elevation of tips after driving.
  8. Final tip and cutoff elevations of piles after driving pile group.
  9. Records of re-driving.
  10. Elevation of splices.
  11. Type, make, model, and rated energy of hammer.
  12. Weight and stroke of hammer.
  13. Type of pile-driving cap used.
  14. Cushion material and thickness.
  15. Actual stroke and blow rate of hammer.
  16. Pile-driving start and finish times, and total driving time.
  17. Time, pile-tip elevation, and reason for interruptions.
  18. Number of blows for every 12 inches of penetration, and number of blows per 1 inch for the last 6 inches of driving.
  19. Pile deviations from location and plumb.
  20. Preboring, jetting, or special procedures used.
  21. Unusual occurrences during pile driving.
- H. Certified Piles Survey: Engage a land surveyor to prepare a piles survey showing final location of piles in relation to the property survey and existing benchmarks.
1. Notify Architect when deviations from locations exceed allowable tolerances.

### 3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
1. Pile foundations.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections:

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1. Dynamic Pile Testing: High-strain dynamic monitoring shall be performed and reported according to ASTM D4945 during initial driving and during restriking on two single piles.
2. Weld Testing: In addition to visual inspection, welds shall be tested and inspected according to AWS D1.1/D1.1M and inspection procedures listed below, at testing agency's option. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.
  - a. Liquid Penetrant Inspection: ASTM E165.
  - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
  - c. Radiographic Inspection: ASTM E94, minimum quality level "2-2T."
  - d. Ultrasonic Inspection: ASTM E164.

D. Steel H piles will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 DISPOSAL

- A. Remove withdrawn piles and cutoff sections of piles from site, and legally dispose of them off Owner's property.

END OF SECTION

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AUGUSTA, MAINE

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. Hot-mix asphalt paving.
2. Curbing.
3. Pavement markings.
4. Traffic signs.

B. Related Requirements:

1. Section 311000 "Site Clearing" for demolition and removal of existing asphalt pavement.
2. Section 312000 "Earth Moving" for subgrade preparation, fill material, and aggregate subbase and base courses.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
  - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacturer hot-mix asphalt.
  - b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.4 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.
2. Job-Mix Designs: Documentation of approval by the Maine Department of Transportation for each job mix proposed for the Work.

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1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Hot mix asphalt delivery tickets.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Maine Department of Transportation Standard Specifications for Highways and Bridges (MDOT), latest edition, for asphalt paving work.
  - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- B. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the Maine Department of Transportation.
- C. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- D. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

1.7 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. Tack Coat: Minimum surface temperature of 50 deg F.
  - 2. Asphalt Binder Course: Minimum surface temperature of 40 deg F and rising at time of placement.
  - 3. Asphalt Surface Course: Minimum surface temperature of 50 deg F at time of placement.
- B. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyl materials and 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.

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- B. Coarse and Fine Aggregate: MDOT, Subsection 703.07, for 0.3 to 3 (18,000 pound) ESAL's.
- C. Mineral Filler: AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

## 2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320, PG 64-28.
- B. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- C. Water: Potable.

## 2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement as permitted by MDOT, provided performance is equal to hot-mix asphalt paving produced from all new materials.
- B. Sand: AASHTO M 29, Grade No. 2 or No. 3.

## 2.4 MIXES

- A. Recycled Content of Hot-Mix Asphalt: As permitted by MDOT, Subsection 401.03.
  - 1. Surface Course Limit: Recycled content no more than 15 percent by weight.
- B. Hot-Mix Asphalt: MDOT, Section 401, dense-graded, hot-laid, hot-mix asphalt plant mixes complying with the following requirements:
  - 1. Provide MDOT approved mixes based on 0.3 to 3 million ESAL's and with a history of satisfactory performance in geographical area where Project is located.
  - 2. Binder Course: Grading type 12.5 mm.
  - 3. Surface Course: Grading type 9.5 mm.

## 2.5 CURBS

- A. Granite Curb: MDOT, Section 712.04, Vertical Granite Curb (Type 1).

## 2.6 TRAFFIC SIGNS

- A. Provide in conformance with MDOT, Section 645, Sign Type 1, Regulatory and Warning Signs, and the Manual on Uniform Traffic Control Devices, latest edition.

## 2.7 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint: MDOT Section 708.03, 100 percent acrylic type, low VOC, fast drying, waterborne traffic paint.



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- a. Color: As indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Compact subgrade below pavements as specified in Section 312000 "Earth Moving." Do not compact wet or saturated subgrades.
  - 1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 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. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
  - 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.

3.3 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 binder course in single lift of thickness indicated.
  - 2. Place hot-mix asphalt surface course in single lift.
  - 3. Spread mix at a minimum temperature of 250 deg F.
  - 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 wide unless infill edge strips of a lesser width are required.
- 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.

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### 3.4 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.
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  - 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.

### 3.5 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.
- 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-mix asphalt course has been uniformly compacted to the following density:
  - 1. Density: Minimum 90 and maximum 97 percent of reference maximum theoretical density according to ASTM D 2041.
- 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.

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3.6 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Binder Course: Plus or minus 1/4 inch.
  - 2. Surface Course: Plus 1/4 inch, 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 straightedge applied transversely or longitudinally to paved areas:
  - 1. Binder Course: 1/4 inch.
  - 2. Surface Course: 1/8 inch.

3.7 CURB INSTALLATION

- A. Granite Curbs: Install according to MDOT, Section 609.03, unless indicated otherwise.

3.8 SIGN INSTALLATION

- A. Install according to MDOT Standard Specifications, Section 645.

3.9 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner.
- B. Allow paving to age for the amount of time recommended by the marking manufacturer before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply marking paint in accordance with Maine Department of Transportation Standard Specifications, Section 627.

3.10 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.

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1. Determine reference maximum theoretical density of the mix in accordance with ASTM D2041 as part of the mix design procedure (indicate on the job mix design submittal) and during each day's production of hot mix to be used on the site.
  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 for every 500 sq. yd. 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 hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.
- 3.11 WASTE HANDLING
- A. Remove excess and unsuitable asphalt paving material and legally dispose of it or recycle off-site.

END OF SECTION

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SECTION 323119 - DECORATIVE METAL FENCES AND GATES

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. Decorative metallic-coated-steel tubular picket fences.
2. Swing gates.
3. Gate operators, including safety devices.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete pads and fence post bases.
2. Section 087111 "Door Hardware" for swing gate hardware.
3. Division 26 Sections for electrical service and connections for system disconnect switches.
4. Section 281500 "Integrated Access Control Hardware Devices" for access control devices installed at gates and provided as part of a security system.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Verify that equipment operation is consistent with system description.
3. Review sequence of operation for each type of equipment.
4. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Shop Drawings: For fencing and gates.

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1. Include plans, elevations, sections, gate locations, post spacing and installation details, and details of hinges, connections, hardware, and accessories, and grounding details.
2. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
3. Wiring Diagrams: Include diagrams for power, signal, and control wiring.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Field quality-control reports.
- C. Product Test Reports: For decorative metallic-coated-steel tubular picket fences, including finish, indicating compliance with referenced standard and other specified requirements.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For gate operators to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced installer approved by ornamental fence and gate manufacturer.
- B. Manufacturer Qualifications: A firm experienced in producing ornamental metal fences and gates similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. 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.
- D. UL Standard: Provide gate operators that comply with UL 325.
- E. Comply with ASTM F2408 for Industrial Application (Class), unless otherwise indicated.
- F. Comply with ASTM F2200, Class III, for automated vehicle gate construction.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wind Loading:
  - 1. Fence Height: 0 to 15 feet.
  - 2. Wind Exposure Category: B.
  - 3. Design Wind Speed: 105 mph.
- B. Lightning-Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

2.2 DECORATIVE METALLIC-COATED-STEEL TUBULAR PICKET FENCES

- A. Decorative Metallic-Coated-Steel Tubular Picket Fences: Provide welded and rackable, 4-rail style with flush bottom rail for gates.
  - 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. Ameristar Perimeter Security; ASSA ABLOY.
    - b. Betafence; Praesidiad Group Limited.
    - c. Fortress Iron.
    - d. Iron World Manufacturing, LLC.
    - e. Master-Halco, Inc.
    - f. Merchants Metals, LLC.
- B. Posts:
  - 1. End Posts: Square tubes 4 by 4 inches formed from minimum 11 gage nominal-thickness, metallic-coated steel sheet or formed from minimum 11 gage nominal-thickness steel sheet and hot-dip galvanized after fabrication.
- C. Post Caps: Formed from steel sheet and hot-dip galvanized after forming.
- D. Rails: Square tubes or double-wall channels.
  - 1. Size: 1-3/4 by 1-3/4 inches.
  - 2. Metal and Thickness: Minimum 0.105-inch nominal-thickness, metallic-coated steel sheet or minimum 0.105-inch nominal-thickness, uncoated steel sheet, hot-dip galvanized after fabrication.
- E. Pickets: 1-inch, square tubes, minimum 16 gage.
  - 1. Terminate tops of pickets at top rail for flush top appearance.
  - 2. Picket Spacing: 4 inches clear, maximum.

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- F. Fasteners: Manufacturer's standard concealed fastening system.
- G. Metallic-Coated Steel Sheet: Galvanized-steel sheet.
- H. Interior surface of tubes formed from uncoated steel sheet shall be hot-dip zinc coated same as exterior.
- I. Galvanizing: For components indicated to be galvanized and for which galvanized coating is not specified in ASTM F2408, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
- J. Finish: All components subjected to an inline electrodeposition coating process consisting of a multi-stage pretreatment/wash, followed by a duplex application of epoxy primer and acrylic topcoat to a minimum combined thickness of 2 mils. Color shall be black.

## 2.3 SWING GATES

- A. Gate Configuration: As indicated.
- B. Gate Frame Height and Width: As indicated.
- C. For pedestrian swing gate, provide external, electric-powered, magnetic lock specified in Section 087111, "Door Hardware."
- D. Automated vehicular gates must comply with ASTM F2200, Class III.
- E. Posts at Pedestrian Swing Gate Openings: Square tubes 4 by 4 inches formed from minimum 11 gage nominal-thickness, metallic-coated steel sheet or formed from minimum 11 gage nominal-thickness steel sheet and hot-dip galvanized after fabrication.
- F. Posts at Vehicle Swing Gate Openings: Square steel tubing 6 by 6 inches with minimum 3/16-inch wall thickness, hot-dip galvanized.
- G. Galvanized-Steel Frames and Bracing: Fabricate vertical members from square tubes 2 by 2 inches formed from minimum 0.120-inch nominal-thickness, metallic-coated steel sheet or formed from minimum 0.119-inch nominal-thickness steel sheet and hot-dip galvanized after fabrication.
  - 1. Fabricate horizontal members from manufacturers' standard formed channel, minimum 1-3/4 by 1-3/4 inches, formed from minimum 14 gage nominal thickness steel sheet, with an effective wall thickness of 0.16 inches, and hot dipped galvanized after fabrication, or approved equal.
- H. Frame Corner Construction: Welded, and 5/16-inch-diameter, adjustable truss rods or manufacturer's standard cable kit for panels 5 feet wide or wider.
- I. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
- J. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.
  - 1. Function: 39 - Full surface, triple weight, antifriction bearing.



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2. Material: Wrought steel, forged steel, cast steel, or malleable iron; galvanized.
- K. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- L. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A123/A123M. For hardware items, hot-dip galvanize to comply with ASTM A153/A153M.
- M. Finish: Same as specified for fence.

## 2.4 GATE OPERATORS

- A. Provide factory-assembled automatic operating system designed for gate size, type, weight, and operation frequency. Provide operation control system with characteristics suitable for Project conditions, with card readers, intercom, remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.
  1. Provide operator designed so motor may be removed without disturbing limit-switch adjustment and without affecting auxiliary emergency operator.
  2. Provide operator with UL approval.
  3. Provide electronic components with built-in troubleshooting diagnostic feature.
  4. Provide unit designed and wired for both right-hand/left-hand opening, permitting universal installation.
  5. Basis-of-Design: FAAC Model 400C BAC with Arctic package.
- B. Comply with NFPA 70.
- C. UL Standard: Manufacturer and label gate operators to comply with UL 325.
- D. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators on gates that must provide emergency access.
- E. Motor Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, within installed environment, with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Comply with NEMA MG 1 and the following:
  1. Voltage: 120 V or NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
  2. Horsepower: Not less than one-half (0.5).
  3. Enclosure: Manufacturer's standard.
  4. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.
  5. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
  6. Phase: One.
- F. Gate Operators: Gate mounted and as follows:
  1. Hydraulic Swing Gate Operators:
    - a. Duty: Heavy duty, commercial/industrial.

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- b. Gate Speed: 90 degrees opening time 18 seconds.
  - c. Maximum Gate Weight: 1300 lb.
  - d. Frequency of Use: 70 cycles per hour.
  - e. Operating Type: Hydraulic swing gate.
  - f. Hydraulic Fluid: Of viscosity required for gate operation at ambient temperature range for Project.
  - g. Locking: Hydraulic in both directions.
  - h. Heater: Manufacturer's standard track and roller heater with thermostatic control.
- G. Remote Controls: Refer to Section 281500 "Integrated Access Control Hardware Devices."
- H. Vehicle Loop Detector: System includes automatic closing timer with adjustable time delay, timer cutoff switch, and loop detector designed to hold gate open until traffic clears. System includes electronic detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light designed to detect presence or transit of a vehicle over an embedded loop of wire and to emit a signal activating the gate operator. System includes number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement, as recommended in writing by detection system manufacturer for function indicated, at location indicated on Drawings.
- I. Vehicle Presence Detector: System includes automatic closing timer with adjustable time delay, timer cutoff switch, and presence detector designed to hold gate open until traffic clears. System includes retroreflective or emitter/receiver detector with adjustable detection zone pattern and sensitivity, designed to detect the presence or transit of a vehicle in gate pathway when infrared beam in zone pattern is interrupted, and to emit a signal activating the gate operator.
- J. Obstruction Detection Devices: Provide each motorized gate with automatic safety sensor(s). Activation of sensor(s) causes operator to immediately function as follows:
  - 1. Action: Reverse gate in both opening and closing cycles, and hold until clear of obstruction.
  - 2. Internal Sensor: Built-in torque or current monitor senses gate is obstructed.
  - 3. Photoelectric/Infrared Sensor System: Designed to detect an obstruction in gate's path when infrared beam in the zone pattern is interrupted.
- K. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop gate at fully retracted and fully extended positions.
- L. Emergency Release Mechanism: Quick-disconnect release of operator drive system of the following type, permitting manual operation if operator fails. Design system so control-circuit power is disconnected during manual operation.
  - 1. Type: Mechanical device, key, or crank-activated release.
- M. Operating Features:
  - 1. Digital Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features with capability for monitoring and auditing gate activity. Provide unit that is isolated from voltage spikes and surges.
  - 2. System Integration: With controlling circuit board capable of accepting any type of input from external devices.

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3. Master/Slave Capability: Control stations designed and wired for gate pair operation.
4. Automatic Closing Timer: With adjustable time delay before closing and timer cutoff switch.
5. Open Override Circuit: Designed to override closing commands.
6. Reversal Time Delay: Designed to protect gate system from shock load on reversal in both directions.
7. Maximum Run Timer: Designed to prevent damage to gate system by shutting down system if normal time to open gate is exceeded.
8. Clock Timer: 24-hour, seven-day programmable for regular events.

N. Accessories:

1. Warning Module: Audio and visual, strobe-light alarm sounding three to five seconds in advance of gate operation and continuing until gate stops moving; compliant with the United States Access Board's ADA-ABA Accessibility Guidelines.
2. Battery Backup System: Battery-powered drive and access-control system, independent of primary drive system.
  - a. Fail-Safe: Gate opens and remains open until power is restored.
  - b. Fail-Secure: Gate cycles on battery power, then fail-safe when battery is discharged.
3. Instructional, Safety, and Warning Labels and Signs: According to UL 325 Manufacturer's standard for components and features specified.

2.5 STEEL AND IRON

- A. Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Tubing: ASTM A500/A500M, cold-formed steel tubing.
- C. Galvanized-Steel Sheet: ASTM A653/A653M, structural quality, Grade 50, with G60 coating.
- D. Castings: Either gray or malleable iron unless otherwise indicated.
  1. Gray Iron: ASTM A48/A48M, Class 30.
  2. Malleable Iron: ASTM A47/A47M.
- E. Fasteners: Type 304 stainless steel. Select fasteners for type, grade, and class required.

2.6 COATING MATERIALS

- A. Epoxy Primer for Galvanized Steel: Epoxy primer recommended in writing by topcoat manufacturer.
- B. Acrylic Polyurethane Intermediate Coat and Topcoat: Complying with MPI #72 and compatible with undercoat.

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## 2.7 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 033000 "Cast-in-Place Concrete," Mixture Class "J".
- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M and specifically recommended by manufacturer for exterior applications.

## 2.8 GROUNDING MATERIALS

- A. Comply with requirements of Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Grounding Connectors and Grounding Rods: Comply with UL 467.
  - 1. Grounding Rods: Copper-clad steel.
    - a. Minimum Size: 5/8 by 96 inches.

## 2.9 METALLIC-COATED-STEEL FINISHES

- A. Galvanized Finish: Clean welds, mechanical connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.
- B. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a zinc-phosphate conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- C. High-Performance Coating: Apply epoxy primer and acrylic polyurethane topcoat to prepared surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
  - 1. Remove and refinish, or recoat work that does not comply with specified requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.

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- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Indicate locations of utilities and underground structures.

### 3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Install fences by setting posts as indicated and fastening infill panels to posts.
- C. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to allow for circular forms (not earth formed) of sizes as indicated on the Drawings.
- D. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
  - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete.
  - 2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
    - a. Concealed Concrete: Set top below grade as indicated on Drawings to allow covering with surface material. Slope top surface of concrete to drain water away from post.
  - 3. Posts Set in Concrete: Comply with fence manufacturer's written instructions. If none, extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete.

### 3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

### 3.5 GATE OPERATOR INSTALLATION

- A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.
- B. Vehicle Loop Detector System: Cut grooves in pavement and bury and seal wire loop according to manufacturer's written instructions. Connect to equipment operated by detector.

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- C. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

### 3.6 GROUNDING AND BONDING

- A. Comply with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fence Grounding: Install at maximum intervals of 1500 feet except as follows:
  - 1. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.
    - a. Gates and Other Fence Openings: Ground fence on each side of opening.
      - 1) Bond metal gates to gate posts.
      - 2) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.
- C. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.
- D. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
- E. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
  - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
  - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
  - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- F. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

### 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
  - 1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than

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natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.

2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
3. Report: Prepare test reports of grounding resistance at each test location certified by a testing agency. Include observations of weather and other phenomena that may affect test results.

### 3.8 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Automatic Gate Operators: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, alarms, and limit switches.
  1. Hydraulic Operators: Purge operating system, adjust pressure and fluid levels, and check for leaks.
  2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  3. Test and adjust controls, alarms, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Lubricate hardware, gate operators, and other moving parts.

### 3.9 CLEANING AND PROTECTION

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work.

### 3.10 DEMONSTRATION

- A. Train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION

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SECTION 323300 - SITE FURNISHINGS

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. Seating.
- B. Related Requirements:
  - 1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts cast in concrete footings.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Samples for Initial Selection: For units with factory-applied finishes.

1.4 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 SEATING

- A. Manufacturers: Subject to compliance with requirements, provide "ParcVue" bench by Landscape Forms or approved equal.



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- B. Frame: Steel.
- C. Seat and Back:
  - 1. Material:
    - a. Steel: Edge framed, evenly spaced, parallel flat straps or bars.
  - 2. Seat Height: As indicated.
  - 3. Seat Surface Shape: Flat.
  - 4. Overall Height: As indicated.
  - 5. Overall Width: As indicated.
  - 6. Overall Depth: As indicated.
  - 7. Arms: Two, one at each end.
    - a. Arm Material: Match frame.
- D. Steel Finish: Color coated.
  - 1. Color: As selected by Architect from manufacturer's full range.
- E. Support Frames: Steel; welded.

## 2.2 TRASH RECEPTACLES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Scarborough Litter by Landscape Forms or comparable product by one of the following:
  - 1. DuMor Inc.
  - 2. Forms+Surfaces
  - 3. Landscape Forms
  - 4. Victor Stanley, Inc
- B. Steel Facing Surrounds: Evenly patterned, parallel flat steel straps, bars, or tubular shapes.
- C. Support Frames: Steel; welded.
- D. Trash Receptacles:
  - 1. Receptacle Shape and Form: Round cylinder; with opening for depositing trash inside of lid or top.
    - a. Vertical strap side panels.
  - 2. Lids and Tops: Matching facing panels secured by cable or chain, hinged, swiveled, or permanently secured.
    - a. Description: Elevated flat or shallow dome rain-cap lid.

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3. Receptacle Height: 41 inches.
4. Overall Width: 25 inch diameter.
5. Weight: 81 pounds.
6. Inner Container: Rigid plastic container with color coordinated to color selected for litter receptacle; designed to be removable and reusable.
7. Capacity: Not less than 30 gal.
8. Service Access: Removable lid or top; inner container and disposable liner lift or slide-out for emptying; keyed lock with two keys per receptacle.

E. Steel Finish: Color coated.

1. Color: As selected by Architect from manufacturer's full range.

## 2.3 MATERIALS

A. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A36/A36M.
2. Sheet: Commercial steel sheet complying with ASTM A1011/A1011M.
3. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F1267.

B. Anchors, Fasteners, Fittings, and Hardware: Stainless steel; commercial quality.

## 2.4 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- D. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

## 2.5 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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2.6 STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION

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SECTION 329115 - SOIL PREPARATION (PERFORMANCE SPECIFICATION)

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 planting soils specified according to performance requirements of the mixes.
- B. Related Requirements:
  - 1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
  - 2. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
  - 3. Section 329300 "Plants" for placing planting soil for plantings.

1.3 DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- F. Imported Soil: Soil that is transported to Project site for use.
- G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.
- H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

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- J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- M. SSSA: Soil Science Society of America.
- N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- O. 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.
- P. 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.
- Q. USCC: U.S. Composting Council.

#### 1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data: For each type of product.
  - 1. Include recommendations for application and use.
  - 2. Include test data substantiating that products comply with requirements.
  - 3. Include sieve analyses for aggregate materials.
  - 4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
    - a. Manufacturer's qualified testing agency's certified analysis of standard products.
    - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SU1P #25.
    - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- C. Samples: For each bulk-supplied material, 1-quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

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1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
  - 1. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on imported soil.
- B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
  - 1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.8 TESTING REQUIREMENTS

- A. General: Perform tests on soil samples according to requirements in this article.
- B. Physical Testing:
  - 1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
    - a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
    - b. Hydrometer Method: Report percentages of sand, silt, and clay.
- C. Fertility Testing: Soil fertility analysis according to standard laboratory protocol of SSSA NAPT NEC-67, including the following:

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1. Percentage of organic matter.
  2. CEC, calcium percent of CEC, and magnesium percent of CEC.
  3. Soil reaction (acidity/alkalinity pH value).
  4. Buffered acidity or alkalinity.
  5. Nitrogen ppm.
  6. Phosphorous ppm.
  7. Potassium ppm.
  8. Manganese ppm.
  9. Zinc ppm.
  10. Copper ppm.
  11. Sodium ppm.
  12. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
  13. Other deleterious materials, including their characteristics and content of each.
- D. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3-Chemical Methods."
- E. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for 6-inch depth of soil.
  2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inch depth of soil.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  3. Do not move or handle materials when they are wet or frozen.
  4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

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PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED ACCORDING TO PERFORMANCE REQUIREMENTS

- A. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of sandy loam soil according to USDA textures; and modified to produce viable planting soil. Amend imported soil with materials specified in other articles of this Section to become planting soil complying with the following requirements:
1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass.
  2. Additional Properties of Imported Soil before Amending: Minimum of 4 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration. Clean soil to be of the following:
    - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
    - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
    - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.
  3. Soil Reaction: pH of 6 to 7.
  4. CEC of Total Soil: Minimum 10 meq/100 mL at pH of 7.0.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
1. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.



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- E. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C33/C33M.

## 2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
  - 1. Feedstock: Limited to leaves.
  - 2. Reaction: pH of 5.5 to 8.
  - 3. Soluble-Salt Concentration: Less than 4 dS/m.
  - 4. Moisture Content: 35 to 55 percent by weight.
  - 5. Organic-Matter Content: 35 to 50 percent of dry weight.
  - 6. Particle Size: Minimum of 98 percent passing through a 1-inch sieve.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.
- C. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
- D. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

## 2.4 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.
- B. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

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- C. Proceed with placement only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- B. Unsuitable Materials: Clean soil to contain a combined maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.
- C. Screening: Pass unamended soil through a 2-inch sieve to remove large materials.

### 3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 8 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
- C. Mixing: Spread unamended soil to total depth of 6 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
  - 1. Amendments: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
    - a. Mix lime and sulfur with dry soil before mixing fertilizer.
    - b. Mix fertilizer with planting soil no more than seven days before planting.
  - 2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

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3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests:
  - 1. Performance Testing: For each amended planting-soil type, demonstrating compliance with specified performance requirements. Perform testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
- C. Soil will be considered defective if it does not pass tests.
- D. Prepare test reports.
- E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.5 PROTECTION

- A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."
- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Vehicle traffic.
  - 4. Foot traffic.
  - 5. Erection of sheds or structures.
  - 6. Impoundment of water.
  - 7. Excavation or other digging unless otherwise indicated.
- C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.6 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

END OF SECTION

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SECTION 329200 - TURF AND GRASSES

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. Seeding.
- 2. Sodding.
- 3. Turf renovation.

B. Related Requirements:

- 1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329115 "Soil Preparation (Performance Specification)" and drawing designations for planting soils.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

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#### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Data: For landscape Installer.
- C. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
  - 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
- D. Product Certificates: For fertilizers, from manufacturer.
- E. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
  - 1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
  - 2. Experience: Ten years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
  - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  - 4. Pesticide Applicator: State licensed, commercial.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation"

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sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
1. Spring Planting: April 15 – June 15.
  2. Fall Planting: August 30 – October 1.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:
1. Quality, Non-State Certified: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
  2. Sun and Partial Shade, Cool-Season Grass: Proportioned by weight as follows:
    - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
    - b. 30 percent chewings red fescue (*Festuca rubra* variety).
    - c. 10 percent perennial ryegrass (*Lolium perenne*).
    - d. 10 percent redtop (*Agrostis alba*).

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2.2 TURFGRASS SOD

- A. Turfgrass Sod: Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species, Cool-Season Grass: Fescue-blend (*Festuca* spp.), sun-shade tolerant.

2.3 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  - 1. Composition:
    - a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.5 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

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1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

### 3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

### 3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329115 "Soil Preparation (Performance Specification)."

B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.

1. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

### 3.4 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.



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- B. Sow seed at a total rate of 3 to 4 lb/1000 sq. ft..
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
  - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

### 3.5 SODDING

- A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Architect prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
  - 1. Lay sod across slopes exceeding 1:3.
  - 2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

### 3.6 TURF RENOVATION

- A. Renovate existing turf where indicated.
- B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
  - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
  - 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.

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- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
  - 1. Soil Amendment(s): According to requirements of Section 329115 "Soil Preparation (Performance Specification)."
  - 2. Initial Fertilizer: Commercial fertilizer applied according to manufacturer's recommendations.
- J. Apply seed and protect with straw mulch or sod as indicated on Drawings and required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

### 3.7 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
  - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
  - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
  - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
  - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
  - 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

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1. Mow Kentucky bluegrass, annual ryegrass, and chewings red fescue to a height of 1-1/2 to 2 inches.
2. Mow turf-type tall fescue to a height of 2 to 3 inches.

D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.

### 3.8 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

### 3.9 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

### 3.10 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

### 3.11 MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately

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after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: 60 days from date of Substantial Completion.
  - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
2. Sodded Turf: 60 days from date of Substantial Completion.

END OF SECTION

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SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plant materials.
2. Fertilizers.
3. Mulches.
4. Herbicides and pesticides.

B. Related Requirements:

1. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.2 COORDINATION

A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.3 ACTION SUBMITTALS

A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.

B. Product Data:

1. Plant materials.
2. Fertilizers.
3. Herbicides and pesticides.

C. Product Data Submittals: For each product.

1. Plant Materials: Include quantities, sizes, quality, and verified sources for plant materials.

D. Samples for Verification: Actual sample of finished products for each of the following:

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1. Organic Mulch: 1-pint volume of each organic mulch required; typical of the lot of material to be furnished, in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Provide an accurate representation of color, texture, and organic makeup.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Qualification Statements: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with manufacturer's certified analysis of standard products.
- D. Pesticides and Herbicides: Product label and manufacturer's written application instructions specific to Project.
- E. Sample Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
  1. Professional Membership: Member in good standing of either the National Association of Landscape Professionals or AmericanHort.
  2. Experience: Ten years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
  3. Installer's Field Supervision: Maintain an experienced full-time supervisor on Project site when work is in progress.
  4. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- C. Measurements: Measure in accordance with ANSI Z60.1. Do not prune to obtain required sizes.

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1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
  2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
  1. Do not dump or store bulk materials near structures, utilities, or walkways and pavements; or on existing turf areas or plants.
  2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- D. Handle planting stock by root ball.
- E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

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1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

#### 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
  1. Spring Planting: April 30 – June 30.
  2. Fall Planting: August 15 – October 15.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions in accordance with manufacturer's written instructions and warranty requirements.

#### 1.9 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
    - b. Structural failures, including plantings falling or blowing over.
  2. Warranty Periods: From date of Substantial Completion.
    - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
    - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
  3. Include the following remedial actions as a minimum:
    - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
    - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
    - c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
    - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.



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PART 2 - PRODUCTS

2.1 PLANT MATERIALS

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
  - 1. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare in accordance with ANSI Z60.1.
- D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for plant.
- E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to ensure symmetry in planting.

2.2 FERTILIZERS

- A. Granular Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  - 1. Composition:
    - a. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
  - 1. Type: Ground or shredded bark.
  - 2. Size Range: 3 inches maximum, 1/2 inch minimum.
  - 3. Color: Natural, dark brown.

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## 2.4 HERBICIDES AND PESTICIDES

- A. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- B. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.
- C. Pesticides: Registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended in writing by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
  - 3. Suspend planting operations during periods of excessive soil moisture until moisture content reaches acceptable levels to attain required results.
  - 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove soil and contamination as directed by Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

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### 3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil in accordance with Section 329115 "Soil Preparation (Performance Specification)."
- B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

### 3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
  - 1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
  - 2. Excavate approximately three times as wide as ball diameter for balled and burlapped, balled and potted, and container-grown stock.
  - 3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
  - 4. Do not excavate deeper than depth of root ball, measured from the root flare to the bottom of root ball.
  - 5. If area under the plant was initially dug too deep, add soil to raise it to correct level and thoroughly tamp the added soil to prevent settling.
  - 6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
  - 7. Maintain supervision of excavations during working hours.
  - 8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as backfill soil unless otherwise indicated.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

### 3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball in accordance with ANSI Z60.1. If root flare is not visible, remove soil in a level manner from root ball to where the top-most root emerges from the trunk. After soil removal to expose root flare, verify that root ball still meets size requirements.

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- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
  - 1. Backfill: Planting soil.
  - 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 4. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.
    - a. Quantity: Two per plant.
  - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
  - 1. Backfill: Planting soil.
  - 2. Carefully remove root ball from container without damaging root ball or plant.
  - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 4. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.
  - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Fabric Bag-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
  - 1. Backfill: Planting soil.
  - 2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 4. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.
  - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- F. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of root ball.

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3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.

3.7 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 INSTALLATION OF MULCHES

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
  - 1. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.9 APPLICATION OF HERBICIDES AND PESTICIDES

- A. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written instructions. Do not apply to seeded areas.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written instructions.
- C. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and in accordance with manufacturer's written instructions. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

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3.10 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.11 REPAIR AND REPLACEMENT

- A. Repair or replace existing or new plants that are damaged by construction operations, in a manner approved by Architect.
  - 1. Submit details of proposed pruning and repairs.
  - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
  - 3. Replace plants that cannot be repaired and restored to full-growth status, as determined by Architect.

3.12 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

END OF SECTION

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SECTION 334200 – STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes gravity-flow, non-pressure storm drainage outside the building, with the following components:
  - 1. Stormwater drainage piping.

1.3 DEFINITIONS

- A. PE: Polyethylene plastic.
- B. PVC: Polyvinyl chloride plastic.
- C. Drain, Waste, and Vent.

1.4 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Product Data:
  - 1. Pipe and pipe fittings.
  - 2. Couplings and other specialties.

1.5 INFORMATIONAL SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 “Submittal Procedures” and the individual sections specifying the work.
- B. Test Reports: Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic pipe, fittings and structures in direct sunlight.

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- B. Protect pipe, pipe fittings, and structures from dirt and damage.

## 1.7 FIELD CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions:
  - 1. Notify Owner no fewer than two weeks in advance of proposed interruption of service.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

### 2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings:
  - 1. Marked with CISPI collective trademark and NSF certification mark.
  - 2. Class: ASTM A74, Extra heavy class.

### 2.3 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway and gasketed bell and spigot joints.
  - 1. Fittings: AASHTO M252, AASHTO M294, or ASTM F 2306, PE with bell ends for gasketed, watertight joints.
  - 2. Gaskets: ASTM F 477, elastomeric seals.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway and gasketed bell and spigot joints.
  - 1. Fittings: AASHTO M252, AASHTO M294, or ASTM F2306, PE with bell ends for gasketed, watertight joints.
  - 2. Gaskets: ASTM F 477, elastomeric seals.

### 2.4 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.



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- B. PVC DWV Pipe and Fittings: ASTM D 2665 (Drain, Waste, and Vent), with socket fittings and solvent cement joints in conformance with ASTM D 2564.

## 2.5 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. 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.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

### 3.2 PIPING APPLICATIONS

- A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
  - 1. Use non-pressure-type flexible couplings where required to join gravity-flow, non-pressure sewer piping, unless otherwise indicated.

### 3.3 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 design considerations into account. 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.

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- C. 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.
- D. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping at elevations indicated and pitched down in direction of flow.
  - 2. Install piping with depth of cover as indicated.
  - 3. Install PE corrugated sewer piping according to ASTM D 2321.
  - 4. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

### 3.4 PIPE JOINT CONSTRUCTION

- A. Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure drainage piping according to the following:
  - 1. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
  - 2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
  - 3. Join dissimilar pipe materials with nonpressure-type flexible couplings.

### 3.5 IDENTIFICATION

- A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping.
  - 1. Use warning tape or detectable warning tape over ferrous piping.
  - 2. Use detectable warning tape over nonferrous piping.

### 3.6 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  - 2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 3. Re-inspect and repeat procedure until results are satisfactory.
- B. Test new piping systems for leaks and defects.

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1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate 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. Option: Test plastic piping according to ASTM F 1417.

3.7 CLEANING

- A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION

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SECTION 334600 - SUBDRAINAGE

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. Foundation drainage.
  - 2. Cleanouts.

1.3 ACTION SUBMITTALS

- A. Submittals shall comply with the requirements of Section 013300 "Submittal Procedures" and the individual sections specifying the work.
- B. Product Data:
  - 1. For each product proposed for use.

PART 2 - PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

- A. Perforated PE Pipe and Fittings:
  - 1. NPS 6 and Smaller: AASHTO M 252, Type SP (perforated, smooth interior); corrugated, with smooth waterway, and gasketed bell and spigot joints.
  - 2. Fittings: AASHTO M252 PE with bell ends for gasketed silt tight joints.
  - 3. Gaskets: ASTM F 477, elastomeric seals.
  - 4. Perforations: Class 2 (1/8 inch by 7/8 inch slots).
- B. Perforated PVC Pipe and Fittings: ASTM D 3034, SDR 35, with bell and spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.2 SOLID WALL AND CLEANOUT RISER PIPE AND FITTINGS

- A. PVC Pipe and Fittings: ASTM D 2665 (Drain, Waste, and Vent), with socket fittings and solvent cement joints in conformance with ASTM D 2564.

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2.3 CLEANOUTS

- A. Cast-Iron Cleanout Covers: ASTM A 48, Class 30, gray cast iron, heavy duty loading class, free of blow holes and other imperfections, with integral flange for casting in concrete.
- B. PVC Cleanouts: ASTM D 2665, PVC cleanout with threaded plug and threaded pipe hub.

2.4 TRANSITION COUPLINGS

- A. Transition couplings are specified in Section 334200 "Stormwater Conveyance."

2.5 SOIL MATERIALS

- A. Soil materials are specified in Section 312000 "Earth Moving."

2.6 GEOTEXTILE FILTER FABRICS

- A. Geotextile filter fabrics are specified in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. Locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.3 FOUNDATION DRAINAGE INSTALLATION

- A. Place foundation drain on subgrade adjacent to footing after concrete footing forms have been removed. Do not excavate below bottom of footing elevation for foundation drainage installation.
- B. Lay flat-style geotextile filter fabric of width required to wrap around stone, on subgrade.
- C. Place supporting layer of crushed stone over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.

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- D. Install drainage piping as indicated in Part 3 "Piping Installation" Article for foundation subdrainage.
- E. Add crushed stone to width of at least 6 inches on each side of pipe to perform tests.
- F. After satisfactory testing, cover drainage piping with crushed stone to depth of at least 6 inches above top of pipe.
- G. Wrap top of crushed stone with flat-style geotextile filter fabric, overlapping edges at least 8 inches.

### 3.4 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in drainage material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
  - 1. Foundation Subdrainage: Install piping pitched down in the direction of flow, unless otherwise indicated.
  - 2. Lay perforated pipe with perforations down, unless indicated otherwise.
  - 3. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
- C. Install thermoplastic piping according to ASTM D 2321.

### 3.5 PIPE JOINT CONSTRUCTION

- A. Join perforated PE pipe and fittings with couplings according to ASTM D 3212 with gasketed bell and spigot joints.
- B. Join perforated PVC sewer pipe and fittings according to ASTM D 3212 with loose bell-and-spigot, push-on joints.
- C. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

### 3.6 CLEANOUT INSTALLATION

- A. Cleanouts for Foundation Subdrainage:
  - 1. Install cleanouts from piping to grade. Locate cleanouts as indicated. Install fittings so cleanouts open in direction of flow in piping.

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2. In nonvehicular-traffic areas, use NPS 4 PVC pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, 12 by 12 by 6 inches deep. Set top of cleanout 1 inch above grade.
3. Comply with requirements for concrete specified in Section 033000 "Cast-in-Place Concrete."

3.7 CONNECTIONS

- A. Comply with requirements for piping specified in Section 334200 "Stormwater Conveyance." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect low elevations of subdrainage system to solid-wall-piping storm drainage system.

3.8 IDENTIFICATION

- A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in specified in Section 312000 "Earth Moving."
  1. Install PE warning tape or detectable warning tape over ferrous piping.
  2. Install detectable warning tape over nonferrous piping and over edges of underground structures.

3.9 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
  2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.
- B. Drain piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.10 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION

