

**Williamston Community Schools**

**Discover Elementary & Kid's Corner  
Secure Entrance**

11.15.2021

2020-006



**FRENCH**  
associates

architects planners interiors

specifications manual specifications manual specifications manual specifications manual

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**ADVERTISEMENT FOR BID**

**WILLIAMSTON COMMUNITY SCHOOLS**

Discovery Elementary School and  
Kid's Corner Secure Entrance  
Project Number 2020-006

Project Addresses:  
350 Highland St., Williamston, MI 48895

Drawings and Specifications and bid forms will be available to Trade Contractors beginning **Monday, November 15, 2021** by contacting French Associates, Inc. Architects via email. Their email address is [ketim@frenchaia.com](mailto:ketim@frenchaia.com). French Associates, Inc. Architects will issue the requesting companies electronic (.pdf) files of the Contract Documents. The cost of document reproduction will be the responsibility of the requesting party.

A **Mandatory Pre-Bid** meeting will be held on **Friday, November 19 at 1pm** at Discovery Elementary School. It is the contractor's responsibility to review the job sites prior to submitting their bid.

Sealed bids will be due **Wednesday, December 1st, 2021 at 1pm** at the Administration Building of the Williamston Community Schools, 418 Highland Street., Williamston, MI 48895, at which time and place the bids will be opened and publicly read aloud.

The School Board will not consider, accept, or open a bid received after the date and time specified for bid submission in this advertisement for bid.

The bids shall be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the owner or any employee of the bidder and any member of the board of the superintendent of the school district. The board will not accept a bid that does not include this sworn and notarized disclosure statement.

The bids shall also be accompanied by a sworn and notarized Iran Economic Sanctions Certification. The board will not accept a bid that does not include this sworn and notarized certification.

Williamston Community School's Board of Education reserves the right to accept or reject any and all Bid Proposals, either in whole or in part, to waive any informalities or irregularities therein, or to award the contract to other than the contractor(s) submitting the best financial Bid Proposal (low bidder), in its sole and absolute discretion.

This project will not be funded by federal or state monies.

Please direct questions to Brandon Weingartz, Director of Facilities at 517-655-7562.

BOARD OF EDUCATION  
Williamston Community Schools  
Amanda Hathaway Frattarelli, Secretary

## SECTION 00 2500 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

### SUMMARY

- A. The requirements of AIA DOCUMENT A701 – 1997 Edition – INSTRUCTIONS TO BIDDERS, apply to this BID except as modified by the CONTRACT DOCUMENTS. References to the “Instructions to Bidders” hereinafter shall mean the above-titled document.
- B. Read and become familiar with, and cause each subcontractor to become familiar with all of these requirements which apply to and are binding on, all who are parties to, or are performing work under the BID.
- C. Any provisions of the Instructions to Bidders that are modified by the SUPPLEMENTARY INSTRUCTIONS TO BIDDERS are superseded to the extent of the modification only and the unmodified provisions shall remain in effect.

### ARTICLE 2 – BIDDER'S REPRESENTATIVES

- A. 2.1, add the following to
  - 2.1.5 Bids shall be based on products indicated in the documents. Bidder's proposed substitutions shall be detailed and separated from the Base Bid Price Proposal as the Bidder's Voluntary Alternates. **Bidder's Voluntary Alternates WILL NOT form the Bidder's Base Bid Proposal Price.** Provide information on a separate sheet stating cost differences, design differences and technical criteria interfacing with adjacent work.
  - 2.1.6 Fair Employment Practice: The bidder, its sub-bidder and agents shall not discriminate against any employee or applicant for employment with respect to hire, tenure, terms, conditions or privileges of employment, because of race, sex, color, religion, national origin, age, height, weight or marital status.

### ARTICLE 3 – BIDDING DOCUMENTS

- A. 3.1 COPIES, add the following:
  - 3.1.5 Plans are available for reference only during business hours to sub-bidders and suppliers at locations listed in the Bid Documents of the Advertisement for Bids.
  - 3.1.6 The drawings and specifications are the property of the architect and must be returned in good order to the architect within ten days of the receiving of proposals.
- B. 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS, add the following:
  - 3.2.4 Bidders and sub-bidders shall promptly notify the Architect of any ambiguity, inconsistency, or error discovered in examining the documents or site and location conditions so that the Architect may issue written clarifications to all bidders. Deadline for addendum response to inquiries is five days prior to the established bid due date. The Architect may issue Addenda before receipt of bids to modify the documents. In the space provided in the bid form, bidders shall acknowledge receipt of such addenda.
- C. 3.3 SUBSTITUTIONS, add the following:
  - 3.3.5 Substitutions: The bidder shall furnish materials as specified and equipment by specified manufacturers, according to provisions of Specification Section 016000. The Bidder's submission of

voluntary alternatives and substitutions shall NOT FORM the Base Bid Price of the proposal, but are listed therein for consideration by the Owner and Architect as proposed substitutions. If accepted, base bid price will be adjusted by the amount listed. (Attach additional sheets using bidder letterhead in the event that more space is required.)

#### ARTICLE 4 – ADMINISTRATION OF THE CONTRACT

- A. 4.1 PREPARATION OF BIDS, add the following:
- 4.1.8 Bids shall be submitted in duplicate on forms furnished. The copies shall be enclosed in a sealed opaque envelope marked "Sealed Bid Enclosed". Bid security is required.
- B. 4.2 BID SECURITY, add the following:
- 4.2.4 Bid security shall be for 5% of the bid amount in the form of a certified check or satisfactory bid bond with a surety licensed to do business in the State of Michigan.
- C. 4.3 SUBMISSION OF BIDS, add the following:
- 4.3.5 Sealed bids will be received as noted in the Advertisement for Bids and Bid Form. Bids will be opened publicly and read aloud.
- 4.3.6 Taxes: The bid affirms that payment of applicable federal, state and local taxes are included therein.
- 4.3.7 Unit Prices: Unit prices shall govern authorized changes in the work and shall include all charges for supervision, overhead and profit and shall be applied to new quantities. The percentages stipulated under the "Overhead and Profit" paragraph below shall not be added to the unit prices stipulated under this article. Unit prices shall be used as a basis for determining cost or credit to the Owner, resulting from a change in work, per Article 7 of the Conditions of the Contract.
- 4.3.8 In accordance with the June 05, 1997 decision by the Sixth Court of Appeals, Michigan Prevailing Wage Rates are valid and enforceable. All contractors must comply with the Michigan Prevailing Wage Act. Attached hereto are Prevailing Wage Rates as published by the Michigan Department of Consumer and Industry Services.
- D. 4.4 MODIFICATOIN OR WITHDRAWAL OF BID, add the following:
- 4.4.5 After receipt of bids, they shall remain firm for (ninety) 90 calendar days.

#### ARTICLE 6 – POST-BID INFORMATION

- A. Paragraph 6.3.1, add the following:
- .4 Cost Itemizations: The bidder shall submit reasonably accurate cost itemizations within seventy-two (72) hours after the time for receipt of bids, as required by the Owner. It is understood that cost itemizations will be required for the Owner's information and accounting purposes.
- .5 Proposed Subcontractors: Within forty-eight (48) hours of the due date and the time of receiving of proposals, the apparent low bidder(s) (General Contractor[s]), shall submit to the Architect, his complete list of sub contractors for the combined work of all trades. The Contractors being considered for the contract award will be notified as soon as possible after the initial review of the proposals. Indicate proposed mechanical and electrical



subcontractors on the Form of Proposal.

ARTICLE 7 – PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 BOND REQUIREMENTS, add the following to 7.1.1:

.1 Bonds must be secured with a surety licensed to do business in the State of Michigan.

B. 7.1 BOND REQUIREMENTS, also add the following:

7.1.4 Bonds: Prior to the signing of the contract of which these conditions shall be a part, the general contractor shall furnish performance bonds and labor and material payment bonds in such form as the Owner may require. Such bonds must be with a recognized corporate surety company. The general contractor's bond shall be for the full amount of the contract, including mechanical and electrical trades.

7.1.5 The accepted bidder shall be required to provide and pay for a satisfactory Performance Bond and Labor and Materials Payment Bond with a surety licensed to do business in the State of Michigan in the amount of 100% of the contract sum if over \$50,000.

.1 The Owner may request Performance Bond and Labor and Material Payment Bond for contracts less than \$50,000.00 and in this case, the cost would be reimbursed by the Owner.

END OF SECTION 00 2500

**SECTION 00 4000 - FORM OF PROPOSAL**

NAME OF BIDDER: \_\_\_\_\_

We, the undersigned, agree to enter into a contract with the Williamston Community Schools \_\_\_\_\_ (here after called the Owner) to provide all labor, material and equipment necessary for the combined work for the project as proposed in accordance with the drawings and specifications prepared by French Associates, Inc.

**PROJECT NAME:**

**Proposal No 1:**  
**DISCOVER ELEMENTARY SCHOOL**  
**SECURE ENTRANCE**  
for the sum of:

\_\_\_\_\_ Dollars  
\$ \_\_\_\_\_

**VOLUNTARY ALTERNATES:** The following voluntary alternates are offered by the respective Bidder. The undersigned understands and agrees that the following amounts WILL NOT be included as part of the Base Bid Proposal Price. Voluntary Alternates which may be accepted by the Owner will be added or deducted from the Base Bid Proposal Price upon agreement with the successful Bidder.

1. \_\_\_\_\_

ADD / DEDUCT: \_\_\_\_\_ Dollars. \$ \_\_\_\_\_

2. \_\_\_\_\_

ADD / DEDUCT: \_\_\_\_\_ Dollars. \$ \_\_\_\_\_

**TIME OF COMPLETION:** We will complete the work covered by the proposal within the number of calendar days indicated in the space below, which includes Saturdays, Sundays, and Holidays and to run consecutively after the date of notice to proceed with work (refer to Division 011000 "Summary", for schedule confines. It is understood that the time of completion will be an important consideration in the awarding of the contract.

Proposal No. 1 \_\_\_\_\_ days

**Proposal No 2:**  
**KID'S CORNER**  
**SECURE ENTRANCE**  
for the sum of:

\_\_\_\_\_ Dollars  
\$ \_\_\_\_\_

**VOLUNTARY ALTERNATES:** The following voluntary alternates are offered by the respective Bidder. The undersigned understands and agrees that the following amounts WILL NOT be included as part of the Base Bid Proposal Price. Voluntary Alternates which may be accepted by the Owner will be added or deducted from the Base Bid Proposal Price upon agreement with the successful Bidder.

1. \_\_\_\_\_

ADD / DEDUCT: \_\_\_\_\_ Dollars. \$ \_\_\_\_\_

2. \_\_\_\_\_

ADD / DEDUCT: \_\_\_\_\_ Dollars. \$ \_\_\_\_\_

**TIME OF COMPLETION:** We will complete the work covered by the proposal within the number of calendar days indicated in the space below, which includes Saturdays, Sundays, and Holidays and to run consecutively after the date of notice to proceed with work (refer to Division 011000 "Summary", for schedule confines. It is understood that the time of completion will be an important consideration in the awarding of the contract.

Proposal No. 2 \_\_\_\_\_ days

**ADDENDA:** In the event that addenda have been received during the bidding covering changes to the drawings and specifications, the bidder shall include the following statement in his proposal:

The work described in the following addenda is included in this proposal:

Addendum No. \_\_\_\_\_ dated \_\_\_\_\_

Addendum No. \_\_\_\_\_ dated \_\_\_\_\_

**SITE VISITATION:**

Each contractor is required to visit the site in order to familiarize themselves and confirm the scope of work outlined in the Summary.

Site visited: Yes  No  Date \_\_\_\_\_

**FAMILIAL RELATIONSHIP DISCLOSURE:**

All bidders must provide familial disclosure in compliance with MCL 380.1267 (P.A. 232 of 2004) and attach this information to the bid. The bids shall be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the owner or any employee of the bidder and any member of board, board of education, chief executive officer or the superintendent of Grosse Pointe Public Schools. The Owner will not accept a bid that does not include this sworn and notarized disclosure statement.

Attached hereto:            Yes  No

Acceptance of Proposal: In accepting this bid, it is understood that the right is reserved by the Owner to reject any or all bids, to waive irregularities in the bidding process or accept any bid, when in the opinion of the Owner, such action will serve the best interests of the Grosse Pointe Public Schools.

**IRAN ECONOMIC SANCTIONS ACT:**

Bidders must also comply with Public Act 517 of 2012, an act to prohibit persons who have certain economic relationships with Iran from submitting bids on requests for proposals with this state, political subdivisions of this state, and other public entities; to require bidders for certain public contracts to submit certification of eligibility with the bid; to require reports; and to provide for sanctions for false certification. The bids shall be accompanied by a sworn and notarized statement certifying compliance with this act. The Owner will not accept a bid that does not include this compliance statement.

Attached hereto:            Yes  No

FIRM NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

FAX NO.: \_\_\_\_\_

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

WITNESS BY: \_\_\_\_\_

(Sealed, if bid is by corporation)

END OF SECTION 00 4000

# DRAFT AIA® Document A201™ – 2017

## General Conditions of the Contract for Construction

### for the following PROJECT:

(Name and location or address)

«Discover Elementary & Kid's Corner - Secure Entrances»  
«Williamston, Michigan»

### THE OWNER:

(Name, legal status and address)

«Williamston Public Schools»« »  
«»

### THE ARCHITECT:

(Name, legal status and address)

«French Associates»« »  
«236 Mill Street  
Rochester, MI 48307»

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### ADDITIONS AND DELETIONS:

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

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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## ARTICLE 1 GENERAL PROVISIONS

### § 1.1 Basic Definitions

#### § 1.1.1 The Contract Documents

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

#### § 1.1.2 The Contract

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

#### § 1.1.3 The Work

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

#### § 1.1.4 The Project

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

#### § 1.1.5 The Drawings

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

#### § 1.1.6 The Specifications

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

#### § 1.1.7 Instruments of Service

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

#### § 1.1.8 Initial Decision Maker

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

### § 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.



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

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

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

### **§ 1.3 Capitalization**

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

### **§ 1.4 Interpretation**

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

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

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

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

### **§ 1.6 Notice**

**§ 1.6.1** Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

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

### **§ 1.7 Digital Data Use and Transmission**

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

### **§ 1.8 Building Information Models Use and Reliance**

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set

forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

## **ARTICLE 2 OWNER**

### **§ 2.1 General**

**§ 2.1.1** The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

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

### **§ 2.2 Evidence of the Owner's Financial Arrangements**

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

**§ 2.2.2** Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

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

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

### **§ 2.3 Information and Services Required of the Owner**

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



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

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

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

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

**§ 2.3.6** Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

#### **§ 2.4 Owner's Right to Stop the Work**

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

#### **§ 2.5 Owner's Right to Carry Out the Work**

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

### **ARTICLE 3 CONTRACTOR**

#### **§ 3.1 General**

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

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

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

### **§ 3.2 Review of Contract Documents and Field Conditions by Contractor**

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

**§ 3.2.2** Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

**§ 3.2.3** The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

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

### **§ 3.3 Supervision and Construction Procedures**

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

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

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

### **§ 3.4 Labor and Materials**

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

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

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

### **§ 3.5 Warranty**

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

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

### **§ 3.6 Taxes**

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

### **§ 3.7 Permits, Fees, Notices and Compliance with Laws**

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

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

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

#### **§ 3.7.4 Concealed or Unknown Conditions**

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

**§ 3.7.5** If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately

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

### **§ 3.8 Allowances**

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

**§ 3.8.2** Unless otherwise provided in the Contract Documents,

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

**§ 3.8.3** Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

### **§ 3.9 Superintendent**

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

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

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

### **§ 3.10 Contractor's Construction and Submittal Schedules**

**§ 3.10.1** The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

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

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

**§ 3.11 Documents and Samples at the Site**

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

**§ 3.12 Shop Drawings, Product Data and Samples**

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

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

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

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

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

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

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

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

**§ 3.12.9** The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.



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

**§ 3.12.10.1** If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

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

### **§ 3.13 Use of Site**

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

### **§ 3.14 Cutting and Patching**

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

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

### **§ 3.15 Cleaning Up**

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

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

### **§ 3.16 Access to Work**

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

### § 3.17 Royalties, Patents and Copyrights

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

### § 3.18 Indemnification

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

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

## ARTICLE 4 ARCHITECT

### § 4.1 General

**§ 4.1.1** The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

### § 4.2 Administration of the Contract

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

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

**§ 4.2.3** On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not

have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

#### **§ 4.2.4 Communications**

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

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

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

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

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

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

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

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

**§ 4.2.12** Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.



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

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

## ARTICLE 5 SUBCONTRACTORS

### § 5.1 Definitions

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

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

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

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

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

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

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

### § 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will

similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

#### **§ 5.4 Contingent Assignment of Subcontracts**

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

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

### **ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

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

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

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

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

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

#### **§ 6.2 Mutual Responsibility**

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

**§ 6.2.2** If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the

Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

### **§ 6.3 Owner's Right to Clean Up**

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

## **ARTICLE 7 CHANGES IN THE WORK**

### **§ 7.1 General**

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

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

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

### **§ 7.2 Change Orders**

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

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

### **§ 7.3 Construction Change Directives**

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

**§ 7.3.2** A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;

- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

**§ 7.3.4** If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

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

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

#### **§ 7.4 Minor Changes in the Work**

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor

change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

## **ARTICLE 8 TIME**

### **§ 8.1 Definitions**

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

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

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

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

### **§ 8.2 Progress and Completion**

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

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

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

### **§ 8.3 Delays and Extensions of Time**

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

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

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

## **ARTICLE 9 PAYMENTS AND COMPLETION**

### **§ 9.1 Contract Sum**

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

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

### **§ 9.2 Schedule of Values**

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



### **§ 9.3 Applications for Payment**

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

**§ 9.3.1.1** As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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

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

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

### **§ 9.4 Certificates for Payment**

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

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

### **§ 9.5 Decisions to Withhold Certification**

**§ 9.5.1** The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot

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

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

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

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

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

## **§ 9.6 Progress Payments**

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

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

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

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

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

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

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

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

### **§ 9.7 Failure of Payment**

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

### **§ 9.8 Substantial Completion**

**§ 9.8.1** Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

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

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

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

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

### **§ 9.9 Partial Occupancy or Use**

**§ 9.9.1** The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented



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

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

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

### **§ 9.10 Final Completion and Final Payment**

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

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

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

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

- .1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2** failure of the Work to comply with the requirements of the Contract Documents;

- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

## **ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY**

### **§ 10.1 Safety Precautions and Programs**

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

### **§ 10.2 Safety of Persons and Property**

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

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

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

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

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

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

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

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

### **§ 10.2.8 Injury or Damage to Person or Property**

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

### **§ 10.3 Hazardous Materials and Substances**

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

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

**§ 10.3.3** To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

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

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

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

### **§ 10.4 Emergencies**

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

## **ARTICLE 11 INSURANCE AND BONDS**

### **§ 11.1 Contractor's Insurance and Bonds**

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

Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

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

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

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

## **§ 11.2 Owner's Insurance**

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

**§ 11.2.2 Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

**§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

## **§ 11.3 Waivers of Subrogation**

**§ 11.3.1** The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds

of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

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

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

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

#### **§ 11.5 Adjustment and Settlement of Insured Loss**

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

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

### **ARTICLE 12 UNCOVERING AND CORRECTION OF WORK**

#### **§ 12.1 Uncovering of Work**

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

**§ 12.1.2** If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.



## **§ 12.2 Correction of Work**

### **§ 12.2.1 Before Substantial Completion**

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

### **§ 12.2.2 After Substantial Completion**

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

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

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

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

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

**§ 12.2.5** Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

## **§ 12.3 Acceptance of Nonconforming Work**

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

## **ARTICLE 13 MISCELLANEOUS PROVISIONS**

### **§ 13.1 Governing Law**

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

### **§ 13.2 Successors and Assigns**

**§ 13.2.1** The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the

other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

### **§ 13.3 Rights and Remedies**

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

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

### **§ 13.4 Tests and Inspections**

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

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

**§ 13.4.3** If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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

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

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

### **§ 13.5 Interest**

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

## ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

### § 14.1 Termination by the Contractor

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

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

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

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

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

### § 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance,



the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

#### **§ 14.3 Suspension by the Owner for Convenience**

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

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

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

#### **§ 14.4 Termination by the Owner for Convenience**

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

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

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

### **ARTICLE 15 CLAIMS AND DISPUTES**

#### **§ 15.1 Claims**

##### **§ 15.1.1 Definition**

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

##### **§ 15.1.2 Time Limits on Claims**

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

##### **§ 15.1.3 Notice of Claims**

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

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

#### **§ 15.1.4 Continuing Contract Performance**

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

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

#### **§ 15.1.5 Claims for Additional Cost**

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

#### **§ 15.1.6 Claims for Additional Time**

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

**§ 15.1.6.2** If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

#### **§ 15.1.7 Waiver of Claims for Consequential Damages**

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

#### **§ 15.2 Initial Decision**

**§ 15.2.1** Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

**§ 15.2.2** The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the

Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

**§ 15.2.3** In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

**§ 15.2.4** If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

**§ 15.2.5** The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

**§ 15.2.6** Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

**§ 15.2.6.1** Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

**§ 15.2.7** In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

**§ 15.2.8** If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

### **§ 15.3 Mediation**

**§ 15.3.1** Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

**§ 15.3.2** The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

**§ 15.3.3** Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

#### § 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

#### § 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

## **SECTION 00 7500 - SUPPLEMENTARY GENERAL CONDITIONS**

### SUMMARY

- A. The requirements of AIA DOCUMENT A201 – 2007 Edition – GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, apply to this CONTRACT except as modified by the CONTRACT DOCUMENTS. References to the “General Conditions” hereinafter shall mean the above-titled document.
- B. Read and become familiar with, and cause each subcontractor to become familiar with all of these requirements which apply to and are binding on, all who are parties to, or are performing work under the CONTRACT.
- C. Make certain that all subcontractors have access to and are made aware of the provisions of the DIVISION 01 SECTIONS in addition to the trade SECTIONS of the SPECIFICATIONS and other applicable CONTRACT DOCUMENTS.
- D. Any provisions of the General Conditions that are modified by the SUPPLEMENTARY CONDITIONS or the DIVISION 01 SECTIONS are superseded to the extent of the modification only and the unmodified provisions shall remain in effect.

### ARTICLE 1 – GENERAL PROVISIONS

#### A. 1.1 BASIC DEFINITIONS:

- 1. Paragraph .1.5 the DRAWINGS: AT THE END OF 1.1.5, add:

The Drawings that are partially diagrammatic shall not be scaled for rough-in measurements nor serve as shop drawings.

- 2. After Paragraph 1.1.8, add:

#### 1.1.9 FURNISH

Means the procurement or fabrication of materials, equipment, or components, or the performance of services to the extent indicated or specified. Where used with respect to materials, equipment, or components, the term shall include delivery to the Project Site but is not intended to include the installation of the item, either temporary or final.

#### 1.1.10 INSTALL

Means the placement of materials, equipment, or components, including the receiving, unloading, transporting, storage, and installing, and the performance of such testing and finish work as is compatible with the degree of installation specified.

#### 1.1.11 PROJECT SITE

The area where the actual construction takes place and the limited adjacent areas as indicated in the Contract Documents.

1.1.12 PROVIDE

Means to furnish and install, complete and in place, including all accessories, finishes, tests, and services as required to render the item so specified completely ready for use.

B. 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS:

1. To 1.2.3, add:

a. In the case of an inconsistency between the Drawings and the Specifications, the better quality or greater quantity of Work shall be provided unless directed otherwise by the Architect.

2. Add:

1.2.4 No guarantee of the accuracy of location of existing work, including piping, sewers, wiring, ducts, structural members and the like shown on the Drawings, or shown on reference drawings of the existing building can be given. Nor shall the Architect-Engineer assume any responsibility for the accurate location of such work. The Contractor shall have complete responsibility for the reasonable protection of existing construction whether underground, aboveground, exposed or concealed and whether shown accurately or not shown on the Drawings. The Contractor shall verify the location of all existing construction before proceeding with the Work.

1.2.5 The Documents contemplate a complete project wherein all items and systems are complete within themselves and in proper quantities and all items and systems are connected properly to other items and/or systems as required to make the project complete and without discontinuities.

1.2.6 Where any item may through oversight be omitted from schedules, Drawings or Specifications or for which no symbol or other instruction or other designation is given for identification, such items in the absence of any definite instructions from the Architect shall be furnished and installed to correspond with adjacent items or similar items for which information is given.

ARTICLE 2 – OWNER

A. 2.1 GENERAL, add:

2.1.3 The term “Owner’s Representative” shall mean the person designated by the OWNER as having authority to act within the rights and responsibilities of the OWNER according to the terms of the Contract Documents.

B. 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER:

1. To 2.2.3, add:

.1 Property lines (when adjacent to the WORK), location ties, and elevations of all structures to be built under this Contract are shown on the Drawings. Elevations shown for various parts of the Work are taken from an established or assumed bench mark datum, as indicated. In case of conflict therein, notify the Architect in writing prior to commencing Work.

.2 The Contractor shall avoid damage to or removal of existing benchmarks and monuments wherever possible. If such damage or removal is necessitated by operations of this Contract, the Contractor shall repair damaged items, and where feasible, replace or relocate such items, all at no cost to the owner. The Contractor shall be held responsible to see that such replaced or repaired topographical items are accurate and correct.

.3 The Contractor shall accurately lay out the Work in conformance with indicated locations. He shall establish temporary benchmarks, stakes, and other markers as may be required for the WORK.

2. Add:

2.2.6 Due to the type and/or age of the building, there is the probability of asbestos materials being present. To this end, the Owner has had the building or area surveyed and remaining known asbestos has been identified. The OWNER will have the known asbestos material removed on a piecemeal basis if it is to be disturbed by the Work of the Contract after prior notification from the Contractor. In the event the Contractor encounters material believed to contain asbestos, the Contractor shall stop work which disturbs the material encountered and immediately notify the Owner's Representative. The Owner shall examine the material and determine if it contains asbestos and shall remove it should the material require removal to maintain a non-hazardous work environment. The Contractor is responsible of notifying his employees where environmental hazards exist.

ARTICLE 3 – CONTRACTOR

A. 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR:

1. To 3.2.2 add:

- .1 The Contractor's report to the Architect regarding discrepancies shall be in writing.
- .2 See also the requirement from the Owner regarding Asbestos, under Article 2. B.

2. To 3.2.4 add:

.1 Any work performed by the Contractor or a Subcontractor without a Written Order or Agreement shall be deemed a part of the work required by the Contract. The Contractor or a Subcontractor shall not be entitled to receive any additional compensation for extra work unless the Owner, by its consent in writing, agrees to pay therefore prior to the commencement of the extra work; the price of alterations or extras to be done shall be fixed or agreed to in writing. The Contractor or a Subcontractor cannot make alterations unless an agreement of the Owner and the Architect to do such work is obtained in writing. If extra work is deemed necessary by the Contractor, or a Subcontractor, immediate notice thereof shall be given to the Owner and the Architect in writing.

B. 3.4 LABOR AND MATERIALS:

1. To 3.4.1 add:



Make all necessary arrangements for, and provide and maintain temporary construction services referred to in 3.4.1 and described in DIVISION 01 SECTIONS as necessary for the work of all workmen employed on the project, until completion and acceptance of the project by the Owner, or until no longer required. When no longer required, discontinue the service and remove all paraphernalia. Bear all costs, except as otherwise specified under each particular system described.

2. Add:

3.4.4 All materials and workmanship shall be first-class in every respect and, unless otherwise specified, all products shall be new and of the latest design. Should any disputes arise as to the quality and fitness of workmanship, products or items, the decisions shall rest strictly with the Architect, and shall be based upon the requirements of the Contract Documents. The Contractor shall, if required by the Architect, furnish evidence as to kind and quality of materials.

3.4.5 In general, it is the intent of the Specifications to permit the use of products of approved manufacture so long as they are fully consistent, in the opinion of the Architect, with the quality and performance requirements of the Project. The conditions and procedures governing proposed substitutions are specified in Section 016000.

3.4.6 The provisions of standards and specifications of technical and trade organizations, underwriting agencies and similar groups that are referred to in these SPECIFICATIONS, govern the quality of products and workmanship to the extent referenced. Where products or work is specified to be in conformity with Standard Specifications of well-know or recognized technical and trade organizations, but no tests are specifically stipulated in connection therewith, the Contractor shall, on request, furnish any test or certification required by the Architect to shown that the proposed products meet with the applicable specifications, all at no cost to the Owner.

3.4.7 Products containing asbestos shall neither be proposed nor used on this Project. However, if the Contractor becomes aware of a product that contains asbestos that was inadvertently specified, the Contractor shall alert the Architect, in writing, and the Architect will direct the Contractor on an alternate product. The Contractor will be required to sign a statement that he will only install asbestos free products.

C. 3.7 PERMITS, FEES AND NOTICES, add:

3.7.6 Provide products and execute the work, including tests and inspections, in accordance with Government laws and ordinances and referenced codes and standards compliance with the applicable provisions of the Federal, State and Local current as of the issue date of this Specification, except where requirements of the contract documents modify portions of such governing laws, ordinances, codes and standards.

D. 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES, TO 3.12.5 add:

Submit shop drawings, product data and samples per Division 01 3300 "Submittal

Procedures.”

E. 3.15 CLEANING UP, add:

3.15.3 Remove all hazardous substances related to construction work to a state-licensed hazardous substance disposal site using closed and sealed containers. Remove all combustible debris to a state-licensed solid waste disposal site. No burning of debris or rubbish will be permitted at the site. OWNER is responsible for removal and disposal of existing hazardous substances.

F. Add paragraph 3.19 EQUAL OPPURTUNITY as follows:

3.19.1 The Contractor and all Subcontractors shall maintain policies of employment as follows:

.1 Do not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. Take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

.2 In all solicitations or advertisements for employees state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, or national origin.

ARTICLE 4 – ADMINISTRATION OF THE CONTRACT

A. 4.1 ARCHITECT, add:

4.1.4 The Architect for this Project is French Associates, Inc. The term Architect is synonymous with the term ARCHITECT-ENGINEER (A/E).

ARTICLE 5 – SUBCONTRACTORS

A. 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK; to 5.2.1, Add:

.1 The above list shall be submitted within ten days of notice of award of Contract.

.2 The submission of such list shall be construed to mean that the Contractor has solicited bids from, and has selected, subject to approval, qualified, responsible persons, contractors, or entities fully capable of producing the particular end results required to provide a complete facility for the Owner.

ARTICLE 6 – CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

A. 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS, add:

- 6.1.5 When Owner-furnished or Separate-Contractor-furnished equipment or material is to be utilized by the Contractor at the construction site, jointly inventory such equipment or material with the Party involved, mutually agreeing as to condition and quantities. Upon completion of the inventory, accept the equipment or material and give the Party involved a signed receipt. The Contractor shall then be responsible for the equipment or material, its protection from damage and availability for installation.

In the absence of such a joint inventory, the Contractor assumes full responsibility for such equipment or material when it comes into his possession. If the Owner or Separate Contractor fails to furnish the equipment or material within the time specified or if none is specified within a reasonable time, an equitable adjustment shall be made pursuant to provisions of the changes clause of the General Conditions.

.1 Such equipment or material will be furnished to the Contractor by any one or all of the following means. Demurrage charges resulting from delay on the part of the Contractor in any of these procedures shall be paid by the Contractor.

- a. Stored on site.
- b. Supplied FOB site, commercial carrier, for unloading at the site by the Contractor
- c. Shipped to points designed by the Contractor upon prior agreement with the Party involve.

.2 Shop drawings and material lists for all Owner-furnished or separate-Contractor-furnished equipment or material will be furnished to Contractor. The shop drawings will indicate the specific characteristics of such equipment or material but will not necessarily show the exact methods of installation in the work of this Contract. Prepare such additional drawings as are necessary to indicate the installation and anchorage conditions of all such equipment or material.

.3 Install Owner-furnished or Separate-Contractor-furnished equipment or material in accordance with the provisions of the applicable Section of these Specifications and the manufacturer's instructions.

.4 At all times protect and preserve all materials, supplies and equipment of every description including property which may be Owner-furnished or Separate-Contractor-furnished and all work performed. All reasonable requests of the Architect-Engineer to enclose or special-protect such property shall be complied with. If, as determined by the Architect-Engineer, material, equipment, supplies and work performed are not adequately protected by the Contractor, such property may be protected by the Owner and the cost thereof may be charged to the Contractor or deducted from any payment due to him.

.5 In the process of handling and installing this equipment, the Contractor shall comply with the following requirements:

- a. Do not drag equipment into place.
- b. Use appropriate protection over floors when using metal skid plates or wooden skids on completed floor surfaces.
- c. Use load-spreading rubber-tired rollers or dollies on finished floors; do not use steel rollers or wheels.
- d. If helicopters are used, make all arrangements, obtain all approvals and necessary insurance, schedule the work to

- preclude interference with any other activity or structure, and observe all safety precautions necessary.
- e. Do not exceed load requirements on access flooring.
- f. All damage to finished floors or floor finishing shall be repaired by the Contractor at no cost to the Owner.

**ARTICLE 7 – CHANGES IN THE WORK**

- A. 7.3 CONSTRUCTION CHANGE DIRECTIVES, Add PARAGRAPH 7.3.8.1:  
“The allowable markups for overhead and profit for Changes in the Work shall not exceed the following percentages. These markups shall be calculated on the net amount of a change, and shall include administration and all costs incidental to the changed work.”

	<b>ADD</b>	<b>DEDUCT</b>
Work by Own Forces	15%	0%
Work by Subcontractor	7 ½%	0%
Materials and Equipment	7 ½%	0%

**ARTICLE 8 – TIME**

- A. 8.3 DELAYS AND EXTENSIONS OF TIME
  - 1. At the end of the 8.3.1, add:  
However, minor modifications in Contract Time resulting from adjustments in the Project construction schedule shall not be deemed cause for action under this Subparagraph 8.3.1.

**ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY**

- A. 10.1 SAFETY PRECAUTIONS AND PROGRAMS, add:
  - 10.1.2 The Contractor shall submit to the Owner a detailed, written report of each accident that occurs at the site.
  - 10.1.3 The Contractor represents that he is conversant with the occupational safety and health regulations for construction promulgated and in force in the state where Work is performed, and agrees to comply with all such regulations applicable to the performance of the Work. The Contractor accepts the affirmative duty of enforcing those regulations, and shall promptly advise the Owner of any investigation by “Safety Officers” at the Contractor’s work place at the job site and of the outcome of any such inspection. The Contractor assumes exclusive responsibility for, and agrees to indemnify the Owner against all consequences of any violations of those regulations by the Contractor, or any Subcontractor, including the payment of any fine, penalty and interest assessed in connection therewith and any court costs and attorneys’ fees incurred by the Owner.
- B. 10.2 SAFETY OF PERSONS AND PROPERTY, add:
  - 1. TO 10.2.1 add:  
.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary, the Contractor shall give the Owner reasonable advance notice.

ARTICLE 11 – INSURANCE AND BONDS

A. 11.1 CONTRACTOR'S LIABILITY INSURANCE:

1. To 11.1.1, add:

The Owner and Architect shall be added as additionally insured parties to the Contractor's insurance policy and shall be covered by the insurance to the same extent as the Contractor. Contractor will furnish copies of said policy prior to starting any work on site or upon signing of contract, whichever is earlier.

2. Replace 11.1.2 with:

11.1.2 Coverage, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment, except for termination of coverage required to be maintained after final payment. The insurance required by Subparagraph 11.1.1 shall be in accordance with the following provisions:

.1 Workmen's Compensation Insurance: The Contractor shall obtain and maintain, during the life of the Contract, Workmen's Compensation Insurance, as required by the State in which the work is located, to insure against liability imposed upon an employer under the State Compensation Law. In case any Work is sublet, the Contractor shall require each Subcontractor similarly to provide Workmen's Compensation Insurance unless covered by the Contractor's insurance.

.2 Employers Liability Insurance: The Contractor shall also take out and maintain during the life of the Contract such insurance in amounts as to adequately protect him from damage claims, in addition to those covered by this regular Compensation insurance, resulting from injuries to any of his employees.

.3 Section 11.1 of the General Conditions shall be amended to include the following provisions:

Contractor will maintain the following insurance: Broad Form Comprehensive General Liability, (including Operations and Premises Liability, Independent Contractors Protective Liability (maintained in effect for a period of three years after the date of final payment), Personal Injury Liability, Broad Form Property Damage Liability endorsement, Explosion, Collapse and Underground Liability endorsement, Blanket Contractual Liability Insurance) Comprehensive Auto Liability, and Workers' Compensation coverage, all of which shall be written on an occurrence basis for not less than the following limits of liability, or any limits required by law whichever is greater:

a. Workmen's Compensation – Statutory/Employers – Liability \$500,000.00

b. Comprehensive General Liability – Per Person (Occurrence)/Aggregate

Bodily & Personal Injury \$1,000,000/\$2,000,000  
Property Damage \$1,000,000/\$2,000,000 Aggregate

c. Automobile Liability – Per Person (Occurrence)/Aggregate

Bodily Injury \$1,000,000  
Property Damage \$1,000,000/\$2,000,000

.4 All insurance shall be carried with insurance companies authorized to do business in the State in which the Work is to be performed. The Contractor shall furnish the owner with satisfactory evidence of insurance coverage provided before entering upon the Owner's Premises or upon signing of contract, whichever is earlier. Evidence of insurance shall include the phone number, name, and address of the insurance agent and includes original signature of Contractor's agent.

3. In 11.1.3 replace the second sentence with:

These certificates and the insurance policies shall contain a provision for thirty days prior written notice to the Owner of cancellation or material change in the insurance.

4. Add Article 11.1.4.1: "Contractor shall require such insurance company to add to the policy the following clause: "The insurance afforded to the Additional Insured is primary insurance. If the Additional Insured have other insurance which is applicable to the loss on an excess or contingent basis, the amount of the company's liability under this policy shall not be reduced by the existence of such other insurance."

#### ARTICLE 12 –CORRECTION OF WORK

A. 12.2.2 AFTER SUBSTANTIAL COMPLETION; add:

.4 The guarantee period for the heating, ventilating and air conditioning systems shall be of such duration as to include a minimum of one complete heating season and one complete cooling season, from Certificate of Occupancy.

.5 Where special warranty is specified, the Contractor, as a condition precedent to final payment, shall submit to the Architect, the warranty in triplicate on 8-1/2-inch by 11-inch paper in the form specified in .5 below.

.6 Special Warranties are designated by the heading "Guarantee" in the respective technical sections of the Specifications.

.7 Responsibility for the securing, verifying, recording, transmitting to the Architect and all other actions regarding the specified warranties rests with the Contractor. The Architect will not accept transmittals of warranties from parties other than the Contractor.

.8 Form of SPECIAL WARRANTY; See Exhibit 1 "FORM OF SPECIAL GUARANTEE" bound at the end of SECTION 01740 as Appendix A.

#### ARTICLE 13 – MISCELLANEOUS PROVISIONS

A. 13.4 RIGHTS AND REMEDIES, add:

13.4.3 Failure by the successful Contractor to execute the Contract and file acceptable bonds as provided herein within ten calendar days after he has receive the Contract for execution, shall be just cause for annulment of the award and the forfeiture of any bidding security to the Owner. If the successful Contractor refuses or fails to execute the Contract within the stipulated time, the Owner may award the Contract to another responsible Contractor – Bidder.

13.4.4 The Owner also encourages alternate products, but all contractors must supply

pricing on as specified products. Equal products must be approved and shown as an alternate, clearly showing the cost as an add or deduct for showing alternate.

B. 13.6 INTEREST, delete heading and contents in its entirety.

END OF SECTION 00 7500





## SECTION 00 8000.02 NON-DISCRIMINATION IN EMPLOYMENT

TO: \_\_\_\_\_  
Name of union or organization of workers

The undersigned currently holds contract(s) with \_\_\_\_\_ (Applicant's Name)  
involving funds or credit of the U.S. Government of (a) subcontract(s) with a prime contractor holding such  
contract(s).

You are advised that under the provisions of the above contract(s) or subcontract(s) and in accordance with  
Executive Order 11246, dated September 24, 1965, the undersigned is obliged not to discriminate against  
any employee or applicant for employment because of race, color, creed, or national origin. This obligation  
not to discriminate in employment includes, but is not limited to the following:

HIRING, PLACEMENT, UPGRADING, TRANSFER, DEMOTION, RECRUITMENT, ADVERTISING,  
SOLICITATION FOR EMPLOYMENT, TRAINING DURING EMPLOYMENT, RATES OF PAY OR OTHER  
FORMS OF COMPENSATION, SELECTION FOR TRAINING INCLUDING, APPRENTICESHIP, LAYOFF  
OR TERMINATION.

This notice is furnished you pursuant to the provisions of the above contract(s) or subcontract(s) and  
Executive Order 11245.

Copies of this notice will be posted by the undersigned in conspicuous places available to employees or  
applicants for employment.

PRINT:

Company Name \_\_\_\_\_ Phone \_\_\_\_\_

Street Address \_\_\_\_\_

City / State / Zip \_\_\_\_\_

Company Officer \_\_\_\_\_ Title \_\_\_\_\_

Officer's Signature \_\_\_\_\_ Date \_\_\_\_\_

## SECTION 00 8000.03 CERTIFICATION OF NON-SEGREGATED FACILITIES

(Applicable to federal assisted construction contracts and related subcontracts exceeding ten thousand dollars ( \$10,000 ) which are not exempt from Equal Opportunity Clause).

The federally assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location under his control, where segregated facilities are maintained. The federally assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The federally assisted construction contractor agrees that (except where he has obtained identical certification from proposed subcontractors for specific time periods) he will obtain identical certification from proposed subcontractors prior to the award of the subcontractors exceeding \$10,000 which are both exempt from the provisions of the Equal Opportunity Clause, and that he will retain such certification in his files.

We ( I ) comply with the above requirements:

PRINT:

Company Name \_\_\_\_\_ Phone \_\_\_\_\_

Street Address \_\_\_\_\_

City / State / Zip \_\_\_\_\_

Company Officer \_\_\_\_\_ Title \_\_\_\_\_

Officer's Signature \_\_\_\_\_ Date \_\_\_\_\_

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C.1001.

**SECTION 00 8000.04 CONTRACTOR NOTIFICATION FORM  
FOR NEW OR RENOVATION WORK  
( In accordance with 40 CFR Part 763.84 [d] )**

As required by the EPA AHERA standard, the Owner is responsible for providing Contractors with information regarding locations of known or assumed asbestos containing material prior to entering a building under the districts jurisdiction.

Please complete this form and return it to French Associates, Inc. – 1600 Parkdale, Rochester, Michigan 48307.

I (We) representing and having authority for \_\_\_\_\_ (company),

hereby indicate and agree that a representative of the Owner, \_\_\_\_\_  
(name and title), has provided me information regarding the specific locations and materials that are asbestos-containing materials which may be encountered or have the potential of being encountered during the course of activities involving \_\_\_\_\_ (project name and

job number) in \_\_\_\_\_ (building).

I expressly agree that neither I nor any of my employees, agents, subcontractors or other individuals or entity over whom I have any responsibility or control, will disturb asbestos-containing materials as listed in the Management Plan for the above mentioned building.

I further understand and agree that should I, my employees, agents, subcontractors or other individuals or entities over whom I have control, encounter any material suspected of containing asbestos, said materials shall not be disturbed without first notifying the Owner and receiving approval that such material may be disturbed.

PRINT:

Company Name \_\_\_\_\_ Phone \_\_\_\_\_

Street Address \_\_\_\_\_

City / State / Zip \_\_\_\_\_

Company Officer \_\_\_\_\_ Title \_\_\_\_\_

Officer's Signature \_\_\_\_\_ Date \_\_\_\_\_

## SECTION 00 8000.05 CONTRACTOR'S CERTIFICATION OF ASBESTOS-FREE PRODUCT AND INSTALLATION

It is hereby understood and agreed that no products/materials containing asbestos, including Chrysotile, Amosite, Crocidolite, Tremolite Asbestos, Anthophyllite Asbestos, Actinolite Asbestos or any combination of these materials that have been chemically treated and/or altered shall be installed or introduced into the building by the Contractor or his employees, agents, subcontractors or other individuals or entities over whom the Contractor has control. The Contractor shall be required to sign this certification statement ensuring that all products or materials installed or introduced into a building will be asbestos-free.

The Contractor shall also be required to furnish certified statements from the manufacturers of supplied materials used during construction verifying their products to be asbestos-free in accordance with the previous paragraph.

Project's Name: \_\_\_\_\_

Project's Address: \_\_\_\_\_

Project's City / State / Zip: \_\_\_\_\_

Architect's Name: \_\_\_\_\_ Project Number \_\_\_\_\_

### CONTRACTOR'S CERTIFICATION

We (I) certify and will direct that all products and materials that will be and/or have been installed or introduced into the above named Project shall be asbestos-free (or less than one-percent (1%) asbestos by weight).

PRINT:  
Company Name \_\_\_\_\_ Phone \_\_\_\_\_

Street Address \_\_\_\_\_

City / State / Zip \_\_\_\_\_

Company Officer \_\_\_\_\_ Title \_\_\_\_\_

Officer's Signature \_\_\_\_\_ Date \_\_\_\_\_

**SECTION 00 8000.07 NON-COLLUSIVE AFFIDAVIT  
( Prime Bidder )**

State of \_\_\_\_\_

County of \_\_\_\_\_

Name: \_\_\_\_\_ being first duly sworn, deposes and says:

That he is (a partner or officer, etc.) of the firm of \_\_\_\_\_ the party making the foregoing proposal or bid, that such proposal or bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived or agreed, directly or indirectly, with any bidder or person, to put in sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of affiant or of any other bidder, or to fix any overhead, profit or cost element of said bid price, or of that of any other bidder, or to secure any advantage against the Owner, \_\_\_\_\_ (Owner) or any person interested in the proposed contract; and that all statements in said proposal or bid are true.

PRINT:

Company Name \_\_\_\_\_ Phone \_\_\_\_\_

Street Address \_\_\_\_\_

City / State / Zip \_\_\_\_\_

Company Officer \_\_\_\_\_ Title \_\_\_\_\_

Officer's Signature \_\_\_\_\_ Date \_\_\_\_\_

BIDDER: if the Bidder is Individual;  
PARTNER: if Bidder is Partnership;  
OFFICER: if the Bidder is a Corporation.

Subscribed and sworn to before me this \_\_\_\_\_ (day) of \_\_\_\_\_ (month) of year 20 \_\_\_\_.

My commission expires: \_\_\_\_\_.

Seal Imprint:

**SECTION 00 8000.08 CERTIFICATION OF COMPLIANCE WITH IRAN ECONOMIC  
SANCTIONS ACT (PA 517 of 2012)**

All Bidders must complete this certification form to indicate compliance with Public Act 517 of 2012, an act to prohibit persons who have certain economic relationships with Iran from submitting bids on requests for proposals with this state, political subdivisions of this state, and other public entities; to require bidders for certain public contracts to submit certification of eligibility with the bid; to require reports; and to provide for sanctions for false certification. This statement must be submitted with the Form of Proposal.

By submitting this sworn and notarized statement with our Form of Proposal, we are certifying to:

(School District / Name) \_\_\_\_\_

that we are in compliance with Public Act 517 of 2012.

PRINT:

Company Name \_\_\_\_\_

Street Address \_\_\_\_\_

City / State / Zip \_\_\_\_\_

Company Officer \_\_\_\_\_

Title \_\_\_\_\_

Officer's Signature \_\_\_\_\_ Date \_\_\_\_\_

State of Michigan

\_\_\_\_\_ (County) \_\_\_\_\_

(Signature)

Notary Public: \_\_\_\_\_

(Printed Name)

Subscribed and sworn to before me this \_\_\_\_\_ (day) of \_\_\_\_\_ (month) of year 20 \_\_\_\_ .

My commission expires: \_\_\_\_\_.

Seal Imprint:





# FILE TRANSFER AGREEMENT

**PROJECT:** XXX PROJECT  
XXX PROJECT  
Somewhere, MI

**PROJECT NO.:** 0000-000

**FIRM:** XXXXX

**TYPE OF WORK:** XXXXX

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## AGREEMENT FOR THE TRANSFER OF INSTRUMENTS OF SERVICE

As per your request, and upon approval by our client, we will provide electronic files for your convenience and use in preparing for your specific work related to the above referenced project, subject to the following terms and conditions:

### Hard Copy Instruments

These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by us and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflicts exist. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project.

### Electronic Data Transfer

Our electronic files are compatible with: *AutoCAD Release 14, Release 2000 and 2003*. We make no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referenced specifications. Other software programs may have been used in the development of the drawings and design of the project. French Associates, Inc. (FA) will not release any of this associated software for use with the electronic files.

Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and / or involvement from each electronic display.

Data contained on these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as a convenience in preparing your work for the above referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to us. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents or sub-consultants that may arise out of or in connection with your use of the electronic files.

Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold us harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from your use of these electronic files.

### Computer Viruses

Computer viruses are a real and serious threat to all computer users. FA takes steps to detect and eliminate computer viruses from our system and the diskettes that are made available to our clients and colleagues. Since computer viruses can attach at any time, FA strongly urges its clients and colleagues to back-up their important data frequently

# FILE TRANSFER AGREEMENT

and to take steps to detect viruses from any files that we make available. Even though FA takes prudent steps to prevent the attachment of computer viruses to its electronic media, we cannot guarantee this.

If an electronic file is requested and provided by FA, it is specifically understood and agreed that use of electronic media provided by FA is done so at the sole risk of the user and the user is responsible for testing for and eliminating computer viruses from any files provided by FA.

### Service Fee

A service fee of three-hundred (\$300.00 Small Project) shall be remitted to us prior to delivery of the electronic files.

Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by us, and we make no warranties, either expressed or implied, of merchantability and fitness for any particular purpose. In no event shall we be liable for any loss of profit or any consequential damages as a result of your use or reuse of these electronic files.

Architect:  
French Associates, Inc.

Agreed by:  
(signing below indicates that we have read and agree to both pages of this agreement)

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Print Name*

\_\_\_\_\_  
*Print Name*

\_\_\_\_\_  
*Title*

\_\_\_\_\_  
*Title*

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

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

## SECTION 01 0400 - COORDINATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

- 1. Generals project coordination procedures.
- 2. Administrative and supervisory personnel.
- 3. Coordination Drawings.
- 4. General installation provisions.
- 5. Cleaning and protection.
- 6. Limitations for use of the site.
- 7. Coordination program.

- B. Related Section: The following Sections contain requirements that relate to this Section:

- 1. Division 01 3100 Section "Project Management and Coordination" for progress meetings, coordination and preinstallation conferences.
- 2. Division 01 6000 Section "Product Requirements" for coordinating materials and equipment for general installation.
- 3. Division 01 7300 Section "Execution Requirements" for Layout and Measurements, specifies procedures for field engineering services, including establishment of benchmarks and control points.

#### 1.3 COORDINATION

- A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend upon each other for proper installation, connection, and operation.

- 1. Schedule construction operations in the 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 assure maximum accessibility for required maintenance, service and repair.
- 3. Make adequate provisions to accommodate items schedule for later installation.

- B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

- 1. Prepare similar memoranda for the Owner and separate Contractors where 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 ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of schedules.
  2. Installation and removal of temporary facilities.
  3. Delivery and processing of submittals.
  4. Progress meetings.
  5. Project closeout activities.

#### 1.4 LIMITATIONS ON USE OF THE SITE

- A. General: Limitations on site usage as well as specific requirements that impact site utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements administer allocation of available space equitably among entities needing both access and space so as to produce the best overall efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on the site.

#### 1.5 SUBMITTALS

- A. Coordination Drawings: Prepare coordination drawings for above ceiling work, equipment rooms and other areas where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.
1. Show the relationship of components on separate Shop Drawings.
  2. Indicate required installation sequence.
- B. Staff Names: Within fifteen (15) calendar days of "Notice to Proceed," submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities. List their addresses and telephone numbers.
1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.
- C. Other Project names, addresses and information:
1. Lists of sub-contractors and erectors.
  2. List of suppliers and manufacturers.

#### PART 2 – PRODUCTS (Not applicable)

#### PART 3 – EXECUTION

##### 3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each component to inspect both the substrate and conditions under which Work is to be performed. Proceed when unsatisfactory conditions have been corrected.

- B. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction.

### 3.2 COORDINATION PROGRAM

- A. It shall be the responsibility of the Construction Manager/General Contractor to coordinate the equipment room requirements and the above ceiling space requirements of the various subcontractors and to determine that adequate clearance is allowed with respect to their equipment and the building.
- B. The Coordination Program shall consist of a series of meetings with all trades involved and the preparation of installation drawings prepared from base drawings produced by the Sheet Metal Subcontractor. The Mechanical, Electrical and Fire Protection Subcontractors shall use the base drawings for producing their individual installation drawing overlays for coordination with other trades.
- C. The following sequence shall be followed:
  - 1. After the award of contract and prior to construction the Construction Manager/General Contractor will schedule a meeting to introduce the Coordination Program and determine its implication to the progress schedule. Attendees shall include the Construction Manager/General Contractor, Owner's Representative, Architect/Engineer and all subcontractors responsible for work in equipment rooms and in or above the ceilings which includes (but is not limited to) those items below:
    - a. Recessed lighting fixtures.
    - b. Plumbing waste, vent and roof drainage.
    - c. Steam, condensate and all other pitched services.
    - d. Ductwork and appurtenances.
    - e. Fire protection (sprinkler system).
    - f. HVAC piping.
    - g. Plumbing, supply and service piping.
    - h. Cable tray.
    - i. Electrical conduit.

(1) The above list, in descending order, is the precedence for space priority. Recessed light fixtures and space for their installation have first priority, plumbing waste, vent and roof drainage has second priority, etc.
  - 2. The Construction Manager/General Contractor shall confirm that the following have been provided to the Sheet Metal Subcontractor prior to commencing the base drawings:
    - a. Approved structural steel drawings.
    - b. Clearance requirements for plumbing, piping, etc. from the Mechanical Subcontractor.
    - c. Clearance requirements for recessed lighting, cable trays, etc. from the Electrical Subcontractor.
    - d. Clearance requirements for piping from the Fire Protection Subcontractor.
  - 3. The Sheet Metal Subcontractor shall prepare and provide the Mechanical, Electrical and Fire Protection Subcontractors with reproducible transparent drawings which shall serve as the base drawings. The base drawings shall show column center lines, interior partition locations, and ceiling heights.
  - 4. The Sheet Metal Subcontractor, with reference and consideration to the structural, mechanical, electrical, fire protection, and plumbing requirements provided and the reflected ceiling plans, shall draw, to scale (minimum 1/4" scale), the proposed ductwork installation showing duct

sizes, equipment layouts, and dimensions from column lines and distance from finished floors to bottom of ducts and equipment. In congested areas, the Sheet Metal Subcontractor shall, in addition, prepare drawings in Section view.

5. The base drawings with ductwork layouts shall be produced in sequence as mandated by the project schedule. The earliest area indicated in the schedule will receive the first effort, etc.
6. When the base drawings for the earliest scheduled area have been completed (time limitation as determined in the initial coordination meeting), the Sheet Metal Subcontractor shall provide the Construction Manager/General Contractor with one set of mylars for each participant in the effort. Upon receipt of the base drawings from the Construction Manager/General Contractor each participant shall incorporate on the drawings, their proposed installation. Each of the subcontractors proposed installation drawings shall indicate to scale, size, equipment layout, equipment clearance requirements, dimensions from column centerlines and distance from the finish floor to bottom of equipment, piping, conduits, etc. The Contract Drawings shall be followed as a general guide for the proposed installation drawings.
7. The major components to be indicated include (but are not limited to):
  - a. Roof drain leaders.
  - b. Waste and vent piping.
  - c. Fire protection piping.
  - d. Plumbing and lab service piping.
  - e. HVAC and Mechanical ductwork routing.
  - f. Electrical conduit and Cable tray runs.
  - g. Contract ceiling heights and Soffit locations.
  - h. Access points for access to valves and Dampers.
  - i. Firewall penetrations.
8. Prior to fabrication of ductwork and within a period of not to exceed two (2) calendar weeks after distribution of the mylars to the individual participants, the Construction Manager/General Contractor will schedule a meeting with the Owner's Representative, the Architect/Engineers and participating Subcontractors at which time areas of conflict shall be resolved through the following process:
  - a. The transparent tracings shall be overlaid on a light table to identify areas of conflict. All parties shall then cooperate in resolving the conflicts.
  - b. The Owner's Representative and the Architect/Engineer reserve the right to determine space priority of the Subcontractors in the event of interference between piping, conduits, ducts and equipment of the various Subcontractors.
  - c. Records of the areas of conflict and the names of the subcontractor who is to make modifications to their drawings shall be kept by the Construction Manager/General Contractor. This record shall be updated on a weekly basis and shall be incorporated into the coordination meeting minutes.
  - d. Once all areas of conflict are resolved, each participant shall revise their drawings and shall submit for review. After review, ductwork can be fabricated, and installation of work can begin. A permanent record of the agreement shall be entered on each Subcontractors' installation drawings, acknowledged by all participants' by signature in a space provided for this purpose. The Construction Manager/General Contractor shall provide and distribute two graphic copies of each subcontractor's signed installation drawings to all parties involved. Revisions to drawings as a result of the coordination process shall not be considered an extra and will not result in a change to the contract.

- e. The above drawings, review and coordination process will be repeated until all areas on the Project have been coordinated.
  - 9. Shop drawings shall be modified through the coordination process to reflect the final resolved locations of equipment prior to submittal for review.
  - 10. In the event a Subcontractor fails to cooperate in the Coordination Program, he shall be held responsible for all costs incurred for adjustments to the work of others made necessary to accommodate the uncooperative Subcontractor's installations.
  - 11. When a Change Order request is issued, the affected Subcontractors shall review the Coordination Drawings and bring to the attention of the Construction Manager/General Contractor any revisions necessary to the work of others affected by the Change Order.
- D. At the completion of the project, each subcontractor shall provide the Construction Manager/General Contractor with a reproducible transparent drawing of the installation drawings to be forwarded to the Owner.

### 3.3 CLEANING AND PROTECTION

- A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.
- B. 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.
- C. Limiting Exposures: Supervise construction activities 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. Where applicable, such exposures include, but are not limited to, the following:
  - 1. Excessive static or dynamic loading.
  - 2. Excessive internal or external pressures.
  - 3. Excessively high or low temperatures.
  - 4. Thermal shock.
  - 5. Excessively high or low humidity.
  - 6. Air contamination or pollution.
  - 7. Water or ice.
  - 8. Solvents.
  - 9. Chemicals.
  - 10. Radiation.
  - 11. Puncture.
  - 12. Abrasion.
  - 13. Heavy traffic.
  - 14. Soiling, staining and corrosion.
  - 15. Bacteria.
  - 16. Rodent and insect infestation.
  - 17. Electrical current.
  - 18. Improper lubrication.
  - 19. Unusual wear or other misuse.
  - 20. Contact between incompatible materials.
  - 21. Misalignment.
  - 22. Excessive weathering.
  - 23. Unprotected storage.
  - 24. Improper shipping or handling.



- 25. Theft.
- 26. Vandalism.

END OF SECTION 01 0400

## SECTION 01 1000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Work covered by the Contract Documents.
  - 2. Type of the Contract.
  - 3. Work phases.
  - 4. Work under other contracts.
  - 5. Products ordered in advance.
  - 6. Owner-furnished products.
  - 7. Use of premises.
  - 8. Owner's occupancy requirements.
  - 9. Work restrictions.
  - 10. Specification formats and conventions.

- B. Related Sections include the following:

#### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Discovery Elementary School & Kid's Corner
  - 1. Project Location: Williamston MI
- B. Owner: Williamston Community Schools
  - 1. Owner's Representative: Brandon Weingartz, Director of Facilities and Operations
- C. Architect: French Associates, Inc.
- D. The Work consists of the following:
  - 1. The Work includes Secure entrance.

#### 1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

## 1.5 PRODUCTS ORDERED IN ADVANCE

- A. General: Owner has negotiated Purchase Orders with suppliers of material and equipment to be incorporated into the Work. Owner will assign these Purchase Orders to Contractor. Costs for receiving, handling, storage if required, and installation of material and equipment are included in the Contract Sum.
1. Contractor's responsibilities are same as if Contractor had negotiated Purchase Orders, including responsibility to renegotiate purchase and to execute final Purchase-Order agreements.
- B. List of Products Ordered in Advance:

## 1.6 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment[ **and making plumbing, mechanical, and electrical connections**].
1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
  2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
  3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
  4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
  5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
  6. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
  7. Contractor shall review Shop Drawings, Product Data, and Samples and return them to **Architect** noting discrepancies or anticipated problems in use of product.
  8. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
  9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
  10. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
  11. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.

## 1.7 USE OF PREMISES

- A. General: Each Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Each Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. General: Each Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- C. Use of Site: Limit use of premises to [**work in areas**] indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to work areas.
    - a. Limit site disturbance, including earthwork and clearing of vegetation, to **40 feet (12.2 m)** beyond building perimeter; **5 feet (1.5 m)** beyond primary roadway curbs, walkways, and main utility branch trenches; and **25 feet (7.6 m)** beyond pervious paving areas.
  2. Owner Occupancy: Allow for Owner occupancy of Project site **and use by the public.**
  3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- D. Use of Existing Building: Maintain existing building in a weather-tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

#### 1.8 OWNER'S OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing building 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 authorities having jurisdiction.
  2. Provide not less than five (5) calendar days notice to Owner of activities that will affect Owner's operations.
- B. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's 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 authorities having jurisdiction.
  2. Provide not less than five (5) calendar days notice to Owner of activities that will affect Owner's operations.
- C. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
  1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
  2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.

3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

## 1.9 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of 3PM to 11PM, Monday through Friday, except otherwise indicated.
- B. 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 to provide temporary utility services according to requirements indicated:
  1. Notify [Owner] not less than [two] days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without [Owner's] written permission.

## 1.10 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.
  1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
  2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.11 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000

## SECTION 01 1400 - WORK RESTRICTIONS

### 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 USE OF PREMISES

- A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
  - 1. Limits: Confine constructions operations to areas delineated on construction documents.
  - 2. Owner Occupancy: Allow for Owner occupancy of site **and use by the public**.
  - 3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Use of Existing Building: Maintain existing building in a weather-tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

#### 1.3 OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing building 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 operations.
- B. Partial Owner Occupancy: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
  - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
  - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
  - 3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate, and maintain mechanical and electrical systems serving occupied portions of building.
  - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.4 ASBESTOS-FREE PRODUCT INSTALLATION

- A. Contractor shall be required to sign a certification statement ensuring that all products or materials installed or introduced into a building will be asbestos-free.
- B. No products/materials containing asbestos, including chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos or any combination of these materials that have been chemically treated and/or altered shall be installed or introduced by the contractor or his employees, agents, subcontractors or other individuals or entities over whom the contractor has control.
- C. Contractor shall also be required to furnish certified statements from the manufacturers of supplied materials used during construction verifying their products to be asbestos-free in accordance with the previous paragraph.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1400



## SECTION 01 2600 - 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. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
  - 1. Construction Change Directives. (CCD)
  - 2. Change Orders. (CO)
  - 3. Alternates.
- B. Related Sections include, but not limited to the following:
  - 1. Division 01 2100 Section "Allowances" for procedural requirements for handling and processing allowances.
  - 2. Division 01 2200 Section "Unit Prices" for administrative requirements for using unit prices.
  - 3. Division 01 6000 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

#### 1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue **through Construction Manager** supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on **[AIA Document G710, "Architect's Supplemental Instructions." Form included at end of Part 3.]**

#### 1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: **Architect** or **Construction Manager** 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. Proposal Requests issued by **Architect** or **Construction Manager** are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within twenty (20) calendar 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 finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to **Architect** or **Construction Manager**.
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 Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use **AIA Document G709 for Proposal Requests**.

## 1.5 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, 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 margins claimed.
  3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
  4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in 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. Submit claims within twenty (20) calendar days of receipt of the Change Order or Construction Change Directive authorizing work to

proceed. Owner will reject claims submitted later than twenty (20) calendar days after such authorization.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

#### 1.6 CHANGE ORDER PROCEDURES (C0)

- A. On Owner's approval of a Proposal Request, **[Architect] [Construction Manager]** will issue a Change Order for signatures of Owner and Contractor on **AIA Document G701**.

#### 1.7 CONSTRUCTION CHANGE DIRECTIVE (CCD)

- A. **[Construction] [Work]** Change Directive: **[Architect] [Construction Manager]** may issue a **[Construction] [Work]** Change Directive on **[AIA Document G714] [EJCDC Document 1910-8-F] [form included at end of Part 3]**. **[Construction] [Work]** Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  1. **[Construction] [Work]** 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] [Work]** Change Directive.
  1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2600

## SECTION 01 2900 - 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. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  - 1. Division 01 2100 Section "Allowances" for procedural requirements governing handling and processing of allowances.
  - 2. Division 01 2600 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

#### 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. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with Continuation Sheets.
    - b. Submittals Schedule.
    - c. Contractor's Construction Schedule.
  - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven (7) calendar days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:
  - a. Project name and location.
  - b. Name of Architect.
  - c. Architect's project number.
  - d. Contractor's name and address.
  - e. Date of submittal.
  
2. 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.
    - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
  
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal 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. If specified, include evidence of insurance or bonded warehousing.
  
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. 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.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
  
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect **and Construction Manager** and paid for by Owner.
1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use **AIA Document G702 and AIA Document G703 Continuation Sheets. AIA Document G702/CMA and AIA Document G703 Continuation Sheets** as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. **[Architect]** will return incomplete applications without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One (1) 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.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens 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 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 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 waivers of lien on forms, executed in a manner acceptable to Owner.
  6. Contractor/Construction Manager: Sworn Statements of waivers.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of Values.
  3. Contractor's Construction Schedule (preliminary if not final).
  4. Products list.
  5. Schedule of unit prices.
  6. Submittals Schedule (preliminary if not final).
  7. List of Contractor's staff assignments.
  8. List of Contractor's principal consultants.
  9. Copies of building permits.
  10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  11. Initial progress report.
  12. Report of preconstruction conference.
  13. Certificates of insurance and insurance policies.
  14. Performance and payment bonds.
  15. Data needed to acquire Owner's insurance.
  16. Initial settlement survey and damage report if required.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707, "Consent of Surety to Final Payment."
  7. Evidence that claims have been settled.
  8. 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.
  9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2900



## SECTION 01 3100 - 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. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Administrative and supervisory personnel.
  - 3. Project meetings.
  - 4. Requests for Interpretation (RFI). Form attached at end of Specification Section.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
  - 1. Division 01 7300 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 2. Division 01 7700 Section "Closeout Procedures" for coordinating closeout of the Contract.

#### 1.3 DEFINITIONS

- A. RFI (Request for Interpretation): Request from Contractors, Fabricators and others seeking interpretation or clarification of the Contract Documents.

#### 1.4 COORDINATION

- A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

- 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.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's Construction Schedule.
  - 2. Preparation of the Schedule of Values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Project closeout activities.
  - 8. Startup and adjustment of systems.
  - 9. Project closeout activities.
  - 10. Agency Inspections.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

## 1.5 SUBMITTALS

- A. COORDINATION DRAWINGS: Prepare Coordination Drawings with other trade contractors to coordinate maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
  - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate required installation sequences.
    - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
  - 2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
  - 3. Number of Copies: Submit quantities and delivery to affected firms in accordance with Division 01 3300 Section "Submittal Procedures".
  - 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

- B. Key Personnel Names: Within fifteen (15) calendar days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.
  2. List names of code officials and other agency personnel.

#### 1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.

#### 1.7 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.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within five (5) calendar days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager, and Architect, but no later than fifteen (15) calendar days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders (C.O.).
    - f. Procedures for RFI (Request for Interpretation).
    - g. Procedures for testing and inspecting.
    - h. Procedures for processing Applications for Payment.
    - i. Procedure for processing (CCD) "Construction Change Directive".

- j. Submittal procedures.
  - k. Preparation of Record Documents.
  - l. Use of the premises and existing building.
  - m. Work restrictions.
  - n. Owner's occupancy requirements.
  - o. Responsibility for temporary facilities and controls.
  - p. Construction waste management and recycling.
  - q. Parking availability.
  - r. Office, work, and storage areas.
  - s. Equipment deliveries and priorities.
  - t. First aid.
  - u. Security.
  - v. Progress cleaning.
  - w. Working hours.
3. Minutes: General Contractor will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents.
    - b. Options.
    - c. Related RFI (Request for Interpretation).
    - d. Related Change Orders (CO).
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility problems.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written recommendations.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Protection of adjacent work.
    - x. Protection of construction and personnel.
  - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - 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 utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) Request for Interpretation (RFI).
      - 16) Status of proposal requests.
      - 17) Status of Construction Change Directive (CCD).
      - 18) Status of Change Orders (CO).
      - 19) Pending claims and disputes.
      - 20) Documentation of information for payment requests.
  3. Minutes: the Construction Manager or General Contractor will record the meeting minutes.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

- 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.
- E. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of 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 utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Change Orders (CO).
  3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

## 1.8 REQUESTS FOR INTERPRETATION (RFI)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFI shall originate with Contractor. RFI submitted by entities other than Contractor will be returned with no response.
  2. Coordinate and submit RFI in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
  2. Date.
  3. Name of Contractor.
  4. Name of Architect and Construction Manager.
  5. RFI number, numbered sequentially.
  6. Specification Section number and title and related paragraphs, as appropriate.
  7. Drawing number and detail references, as appropriate.
  8. Field dimensions and conditions, as appropriate.
  9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  10. Contractor's signature.
  11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy of Request for Information (RFI): Form attached at end of Specification Section.
1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFI: Software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and return it. Allow seven (7) calendar days for Architect's response for each RFI.
1. The following RFI will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for coordination information already indicated in the Contract Documents.
    - d. Requests for adjustments in the Contract Time or the Contract Sum.
    - e. Requests for interpretation of Architect's actions on submittals.
    - f. Incomplete RFI or RFI with numerous errors.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
  3. Architect's action on RFI 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 Division 01 Section "Contract Modification Procedures."

- a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within five (5) calendar days of receipt of the RFI response.
- F. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within five (5) calendar days if Contractor disagrees with response.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFI organized by the RFI number. Submit log weekly to include the following:
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect and Construction Manager.
  4. RFI number including RFI that were dropped and not submitted.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's and Construction Manager's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  9. Identification of related Field Order, Construction Change Directive, and Proposal Request (Bulletin), as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

- 3.1 A. Copy of (RFI) "Request for Interpretation" form attached at end of Section.

END OF SECTION 01 3100



# REQUEST FOR INTERPRETATION ( R.F.I. )

**Project Name** \_\_\_\_\_ **R.F.I. Number** \_\_\_\_\_

**Architect's Project Number** \_\_\_\_\_ **Date Issued** \_\_\_\_\_

**To French Associates** \_\_\_\_\_ **From CM/GC** \_\_\_\_\_

**SubContr. Requesting Info.** \_\_\_\_\_ **SubContr. Ref. #** \_\_\_\_\_

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**Reference**

Specification Section \_\_\_\_\_ Drawings # \_\_\_\_\_

**Interpretation Request**

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Requested by \_\_\_\_\_ Date \_\_\_\_\_

**A/E Response** \_\_\_\_\_ **Date Received** \_\_\_\_\_

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Response by A/E \_\_\_\_\_ Date \_\_\_\_\_

**Signed by French Assoc:** \_\_\_\_\_ **Date Returned:** \_\_\_\_\_

Copies To  
\_\_\_\_ Const. Manager or Gen. Contr. \_\_\_\_\_  
\_\_\_\_ Architect \_\_\_\_\_  
\_\_\_\_ Mech. Consultant \_\_\_\_\_  
\_\_\_\_ Owner \_\_\_\_\_  
\_\_\_\_ Struct. Consultant \_\_\_\_\_  
\_\_\_\_ Elect. Consultant \_\_\_\_\_  
\_\_\_\_ Others \_\_\_\_\_

## SECTION 01 3300 - SUBMITTAL 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. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
  - 1. Shop drawings and Samples
  - 2. Product data submittal procedures.
  - 3. Shop Drawing and Samples Transmittal Form.
  - 4. Contract Close-out Deliverables Form.
  
- B. Related Sections include the following:
  - 1. Division 01 2900 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
  - 2. Division 01 3100 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
  - 3. Division 01 4000 Section "Quality Requirements" for submitting test and inspection reports.
  - 6. Division 01 7700 Section "Closeout Procedures" for submitting warranties.
  - 7. Division 01 7700 Section "Closeout Procedures" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 8. Division 01 7700 Section "Closeout Procedures" for submitting operation and maintenance manual.
  - 9. Division 01 7700 Section "Closeout Procedures" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
  - 10. Divisions 02 0000 through 33 0000 Sections for specific requirements for submittals in those Sections.

#### 1.3 DEFINITIONS

- A. Action Submittals (Shop Drawings, Samples, Product Data, Catalog Cuts, etc.): Written and graphic information that requires Architect's responsive action.
  
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

#### 1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings may be provided at Architect's discretion and at extra cost to Contractor for use in preparing submittals.
- 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. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. **Architect reserve** the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 3200 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Structural steel shop drawings: Prior to the submittal of shop drawings, Pre-submittal Drawings shall be submitted – refer to spec section 05 1200 Structural Steel Framing. The architect and structural engineer will review the Pre-submittal Drawings to clarify the design intent of the Construction Documents and provide additional information as required.
- E. Processing Time: Allow enough 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 twenty (20) calendar 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. Resubmittal Review: Allow fifteen (15) calendar days for review of each resubmittal.
  3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty (20) calendar days for initial review of each submittal.
  4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow fifteen (15) calendar days for review of each submittal. Submittal will be returned to **the Architect**, before being returned to Contractor.
- F. Shop Drawing Submittal Procedures: The procedures and quantity of drawings, catalog cuts, samples and other information for submittal are minimum. The Contractor and Architect will finalize format at the Project Kick-Off Meeting. The direct submittal delivery procedures to affected parties is intended to expedite the review turn-around period by the Architect and his Consultants.

Information shall be submitted directly in the following manner:

Note: Architect's Consultants will review information and deliver to Architect for distribution.

**1. \*\*\*Contractor to Architect**

\*\*\*Architect Reviewed to Contractor

\*Architectural Drawings ---- 1 reproducible & 3 prints \* 1 reproducible drawing  
\*Product Data/Cat. Cuts -- 4 sets \* 2 sets  
\*Samples ----- 3 of each range \* 2 samples

**2. a. \*\*\* Contractor to Structural Consultant**

\*Structural drawings ----- 1 reproducible, 2 prints  
\*Product Data/Cat cuts -- 3 sets

b. **\*\*\*Contractor to Architect** \*\*\*Architect Reviewed to Contractor

\*Structural Drawings ---- 1 print \* 1 reproducible drawing  
\*Product Data/Cat cuts -- 1 set \* 2 sets

**3. a. \*\*\*Contractor to Mechanical Consultant**

\*Mechanical Drawings ----1 reproducible & 2 prints  
\*Product Data/Cat. Cuts --3 sets

b. **\*\*\*Contractor to Architect** \*\*\*Architect Reviewed to Contractor

\*Mechanical Drawings -----1 print \* 1 reproducible drawing  
\*Product Data/Cat. Cuts ----- 1 set \* 2 sets

**4. a. \*\*\*Contractor to Electrical Consultant**

\*Electrical Drawings ----- 1 reproducible & 2 prints  
\*Product Data/Cat./Cuts ----- 3 sets

b. **\*\*\*Contractor to Architect** \*\*\*Architect Reviewed to Contractor

\*Electrical Drawings ----- 1 print \* 1 reproducible drawing  
\*Product Data/Cat. Cuts ----- 1 set \* 2 sets

**5. \*\*\*Contractor to Civil Consultant** \*\*\*Architect Reviewed to Contractor

\*Same as for Mechanical Consultant \*Same as for Mech. Consultant

**6. \*\*\*Contractor to Food Service Consultant** \*\*\*Architect Reviewed to Contractor

\*Same as for Mechanical Consultant \*Same as for Mech. Consultant

**7. \*\*\*Contractor to Landscape Consultant** \*\*\*Architect Reviewed to Contractor

\*Same as for Mechanical Consultant \*Same as for Mech. Consultant

**8. \*\*\*Other Consultants** \*\*\*Architect Reviewed to Contractor

\*Same as for Mechanical Consultant \*Same as for Mech. Consultant

G. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately 4 x 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Submittal number or other unique identifier, including revision identifier.
      - 1) Submittal number shall use whole numbers for the first submittal.  
Example: Architectural = A-001  
  
Mechanical = M-001  
  
Electrical = E-001
      - 2) Resubmittals for the same item shall be identified with the original first whole submittal number and the resubmitted number following the decimal point.  
Example: Architectural = A-001.1 (first resubmittal)  
  
A-001.2 (second resubmittal) and etc.
    - i. Number and title of appropriate Specification Section.
    - j. Drawing number and detail references, as appropriate.
    - k. Location(s) where product is to be installed, as appropriate.
    - l. Other necessary identification.
- H. Deviations: **Highlight and encircle**, or otherwise specifically identify deviations from the Contract Documents on submittals.
- I. 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.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
  2. Additional copies submitted for maintenance manuals will **not** be marked with Architect's Transmittal action review and will be discarded and returned only upon contractor's written request.
- J. Transmittal: Package each submittal item individually and appropriately for transmittal and handling. Transmit each submittal using the official transmittal form. Architect received submittals from sources other than Construction Manager or General Contractor will be discarded without review.
1. Transmittal Form: **Use submittal form included at the end of Specification.**
  2. Form:

- a. Project name.
  - b. Date.
  - c. Destination (To:).
  - d. Source (From:).
  - e. Names of subcontractor, manufacturer, and supplier.
  - f. Category and type of submittal.
  - g. Submittal purpose and description.
  - h. Specification Section number and title.
  - i. Drawing number and detail references, as appropriate.
  - j. Transmittal number, **numbered consecutively**.
  - k. Submittal and transmittal distribution record.
  - l. Remarks.
  - m. Signature of transmitter.
- K. 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 Architect's "REVIEWED FOR CONSTRUCTION" or Architect's "REVIEWED AS NOTED" stamp.
- L. 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.
- M. Use for Construction: Use only final submittals with mark indicating Architect's "REVIEWED FOR CONSTRUCTION" or "REVIEWED AS NOTED" stamp and Construction Manager's or General Contractor's release for construction stamp.
1. DO NOT USE Shop Drawings noted "XRR = RETURNED FOR CORRECTIONS" for construction or fabrication.
- 1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES
- A. General: At Contractor's written request, copies of Architect's CAD files may be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
1. Request "Electronic File Transfer Agreement Form", refer to Division 00 Section 008500.

## PART 2 - PRODUCTS

### 2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
1. Submit electronic submittals directly to extranet specifically established for Project.
- B. 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 printed data are not suitable 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 written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Manufacturer's catalog cuts.
    - f. Wiring diagrams showing factory-installed wiring.
    - g. Printed performance curves.
    - h. Operational range diagrams.
    - i. Mill reports.
    - j. Standard product operating and maintenance manuals.
    - k. Compliance with specified referenced standards.
    - l. Testing by recognized testing agency.
    - m. Application of testing agency labels and seals.
    - n. Notation of coordination requirements.
  4. Submit Product Data concurrent with Samples.
  5. Number of Copies: Submit copies as indicated in Part 1.4 "Submittal Procedures".
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, power, signal, and control wiring.
    - f. Shop work manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.
    - l. Notation of dimensions established by field measurement.
    - m. Relationship to adjoining construction clearly indicated.
    - n. Seal and signature of professional engineer if specified.
    - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches (215 by 280 mm)** but no larger than **30 by 40 inches (750 by 1000 mm)**.
  3. Number of Copies: Submit copies as indicated in Part 1.4 "Submittal Procedures".
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of appropriate Specification Section.
  2. 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.
  3. 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 (1) 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.
  4. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit number of samples as indicated in Part 1.4 "Submittal Procedures".
      1. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2. If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.
- E. Product Schedule or List: 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.
  2. Room name, room number, space and location.
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.



- G. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- H. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- J. 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, and telephone number 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.
  - 4. Number of Copies: Submit two (2) copies of subcontractor list, unless otherwise indicated.
- K. LEED (Sustainable Design Requirements) Submittals: Comply with requirements specified in Division 01 8113.L Section "Sustainable Design Requirements."
  - 1. Number of Copies: Submit **three (3)** copies of LEED submittals, unless otherwise indicated.
- L. Material Safety Data Sheets (MSDSs) for LEED Certification: Submit information necessary to show compliance with LEED certification requirements, which will be the limit of the Architect's review.
  - 1. Architect will not review non-LEED submittals that include MSDSs and will return the entire submittal for resubmittal.

## 2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
  - 1. Number of Copies: Submit two (2) copies of each submittal, unless otherwise indicated. Architect will not return copies.
  - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  - 3. Test and Inspection Reports: Comply with requirements in Division 01 4000 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 3100 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements in Division 01 3200 Section "Construction Progress Documentation."

- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare 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.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare 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.
- K. Product Test Reports: Prepare written reports indicating 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.
- L. Research/Evaluation Reports: Prepare 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:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 4000 Section "Quality Requirements."
- N. Preconstruction Test Reports: Prepare 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.
- O. Compatibility Test Reports: Prepare 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 primers and substrate preparation needed for adhesion.

- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 7700 Section "Closeout Procedures" for Operation and Maintenance Data."
- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
  2. Required substrate tolerances.
  3. Sequence of installation or erection.
  4. Required installation tolerances.
  5. Required adjustments.
  6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles and term of the coverage. Usually delete below. Receipt of Material Safety Data Sheet information by Architect may result in unwanted liability for product safety. See Evaluations.
- V. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect, **except as required in "Action Submittals" Article.**

1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

## 2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three (3) copies of 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.
  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.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. 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 Contractor's review approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, 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.

### 3.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

- A. General: Architect will not review submittals that do not bear Construction Manager's or General Contractor's review approval stamp and will return them without action.
- B. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action to be taken.
- C. Informational Submittals: Architect will review each submittal and will return it to the Construction Manager or General Contractor with review comments for their review.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

### 3.3 ARCHITECT'S FORMS

- A. Shop Drawings and Samples Transmittal form, attached at end of Section.

B. Contract Close-out Deliverables form, attached at end of Section.

END OF SECTION 01 3300



**SHOP DRAWING AND SAMPLES TRANSMITTAL**

FA Submittal No. \_\_\_\_\_

Project Name:	Architect's Projects No.:	Submittal Date:
	Contr. Proj. No.	<input type="checkbox"/> Resubmittal

FROM: CM/CONTR. NAME CM/CONTR. NAME CM/CONTR. ADDRESS	TO:	DATE:	QTY:	COMMENTS:	RECEIVED STAMP HERE
		<input type="checkbox"/> UPS			
		<input type="checkbox"/> COURIER			
		<input type="checkbox"/> DELIVERY			
SIGNATURE:		<input type="checkbox"/> PICK-UP			

FROM:	TO:	DATE:	QTY:	COMMENTS:	RECEIVED STAMP HERE
		<input type="checkbox"/> UPS			
		<input type="checkbox"/> COURIER			
		<input type="checkbox"/> DELIVERY			
SIGNATURE:		<input type="checkbox"/> PICK-UP			

FROM:	TO:	DATE:	QTY:	COMMENTS:	RECEIVED STAMP HERE
		<input type="checkbox"/> UPS			
		<input type="checkbox"/> COURIER			
		<input type="checkbox"/> DELIVERY			
SIGNATURE:		<input type="checkbox"/> PICK-UP			

FROM:	TO:	DATE:	QTY:	COMMENTS:	RECEIVED STAMP HERE
		<input type="checkbox"/> UPS			
		<input type="checkbox"/> COURIER			
		<input type="checkbox"/> DELIVERY			
SIGNATURE:		<input type="checkbox"/> PICK-UP			

Spec Section (not Bid Ctg.)	CM / Contr. Submittal No.	Qty.	Description:( Drawings, Data, Cat, Samples)	Sub-Contractor Name, Supplier / Manufacturer Name	Architect Review Code

Contractor(s) certifies that the above submitted information has been reviewed in detail and comply with the Contract Documents, except as indicated, and is submitted to the Architect, " FOR REVIEW AND COMMENTS ONLY." The Architect's and Engineer's critique will not relieve the Contractor(s) from compliance with requirements of the Contract Documents. Contractor(s) assumes responsibility for all information and comments indicated in Shop Drawings.	Architect Review Code Legend	RC = Reviewed for Construction RN = Reviewed as Noted XRR = Returned for Corrections
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## SECTION 01 4000 - 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. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
  - 1. Division 01 7329 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
  - 2. Divisions 02 0000 through 33 0000 Sections for specific test and inspection requirements.

#### 1.3 DEFINITIONS

- A. **Quality-Assurance Services:** Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. **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. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. **Mockups:** Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where

indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

#### 1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.

#### 1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.
  - 3. Identification of applicable standards.
  - 4. Identification of test and inspection methods.
  - 5. Number of tests and inspections required.
  - 6. Time schedule or time span for tests and inspections.



7. Entity responsible for performing tests and inspections.

C. Reports: Prepare and submit certified written reports that include the following:

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

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.6 QUALITY ASSURANCE

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

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. 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.

D. 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.

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

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

- G. Testing Agency Qualifications: An NRTL, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
  2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
  2. Notify Architect and Construction Manager seven (7) calendar days in advance of dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven (7) calendar days for initial review and each re-review of each mockup.
  5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  6. Demolish and remove mockups when directed, unless otherwise indicated.

- K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through Divisions 33.

## 1.7 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 inspecting they are engaged to perform.
  2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
  3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, **and the Contract Sum will be adjusted by Change Order.**
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. 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.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  2. Notify testing agencies at least forty-eight (48) hours in advance of time when Work that requires testing or inspecting will be performed.
  3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. 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 Division 01 3300 Section "Submittal Procedures."
- D. 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.
- E. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractors in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager, and Contractors promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel.
1. Incidental labor and facilities necessary to facilitate tests and inspections.
  2. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  3. Facilities for storage and field curing of test samples.
  4. Delivery of samples to testing agencies.
  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 inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within thirty (30) calendar days of date established for **commencement of the Work or the Notice to Proceed**.
1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- 1.8 SPECIAL TESTS AND INSPECTIONS
- A. Special Tests and Inspections: Owner may engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
- B. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Architect, Construction Manager, and Contractors promptly of irregularities and deficiencies observed in the Work during performance of its services.

3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, Construction Manager, with copy to Contractors and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 ACCEPTABLE TESTING AGENCIES

- A. Architect and Owner will select testing agency before construction begins.
  1. Construction Manager or Contractor may recommend testing agency firm to the Architect or Owner for decision.

### 3.2 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Construction Manager's reference during normal working hours.

### 3.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
  2. Comply with the Contract Document requirements for Division 01 7329 Section "Cutting and Patching."
- 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 01 4000

## SECTION 01 4200 - 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," "approved," "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": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- 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.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- 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.
- D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA)	(800) 872-2253
	Architectural Barriers Act (ABA)	
	Accessibility Guidelines for Buildings and Facilities	(202) 272-0080
	Available from Access Board <a href="http://www.access-board.gov">www.access-board.gov</a>	
CFR	Code of Federal Regulations	(888) 293-6498
	Available from Government Printing Office	(202) 512-1530
	<a href="http://www.gpoaccess.gov/cfr/index.html">www.gpoaccess.gov/cfr/index.html</a>	
CRD	Handbook for Concrete and Cement	(601) 634-2355
	Available from Army Corps of Engineers Waterways Experiment Station <a href="http://www.wes.army.mil">www.wes.army.mil</a>	
DOD	Department of Defense Military Specifications and Standards	(215) 697-6257
	Available from Department of Defense Single Stock Point <a href="http://www.dodssp.daps.mil">www.dodssp.daps.mil</a>	
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification	(215) 697-6257
	Available from Department of Defense Single Stock Point <a href="http://www.dodssp.daps.mil">www.dodssp.daps.mil</a>	
	Available from General Services Administration	(202) 501-1021



[www.fss.gsa.gov](http://www.fss.gsa.gov)

Available from National Institute of Building Sciences

(202) 289-  
7800

[www.nibs.org](http://www.nibs.org)

FTMS Federal Test Method Standard  
(See FS)

UFAS Uniform Federal Accessibility Standards

(800) 872-  
2253

Available from Access Board

(202) 272-  
0080

[www.access-board.gov](http://www.access-board.gov)

#### 1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) <a href="http://www.aluminum.org">www.aluminum.org</a>	(202) 862-5100
AAADM	American Association of Automatic Door Manufacturers <a href="http://www.aaadm.com">www.aaadm.com</a>	(216) 241-7333
AABC	Associated Air Balance Council <a href="http://www.aabchq.com">www.aabchq.com</a>	(202) 737-0202
AAMA	American Architectural Manufacturers Association <a href="http://www.aamanet.org">www.aamanet.org</a>	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials <a href="http://www.transportation.org">www.transportation.org</a>	(202) 624-5800
ACI	ACI International (American Concrete Institute) <a href="http://www.aci-int.org">www.aci-int.org</a>	(248) 848-3700
ACPA	American Concrete Pipe Association <a href="http://www.concrete-pipe.org">www.concrete-pipe.org</a>	(972) 506-7216
AGA	American Gas Association <a href="http://www.aga.org">www.aga.org</a>	(202) 824-7000

AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722

ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
FM	Factory Mutual System (Now FMG)	
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
HMMA	Hollow Metal Manufacturers Association	

(Part of NAAMM)

HPVA	Hardwood Plywood & Veneer Association <a href="http://www.hpva.org">www.hpva.org</a>	(703) 435-2900
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) <a href="http://www.ieee.org">www.ieee.org</a>	(212) 419-7900
IESNA	Illuminating Engineering Society of North America <a href="http://www.iesna.org">www.iesna.org</a>	(212) 248-5000
ILI	Indiana Limestone Institute of America, Inc. <a href="http://www.iliai.com">www.iliai.com</a>	(812) 275-4426
LPI	Lightning Protection Institute <a href="http://www.lightning.org">www.lightning.org</a>	(800) 488-6864 (847) 577-7200
MFMA	Maple Flooring Manufacturers Association <a href="http://www.maplefloor.org">www.maplefloor.org</a>	(847) 480-9138
MFMA	Metal Framing Manufacturers Association <a href="http://www.metalframingmfg.org">www.metalframingmfg.org</a>	(312) 644-6610
MIA	Marble Institute of America <a href="http://www.marble-institute.com">www.marble-institute.com</a>	(440) 250-9222
NAAMM	National Association of Architectural Metal Manufacturers <a href="http://www.naamm.org">www.naamm.org</a>	(312) 332-0405
NAGWS	National Association for Girls and Women in Sport <a href="http://www.aahperd.org/nagws/">www.aahperd.org/nagws/</a>	(800) 213-7193 ext. 453
NAIMA	North American Insulation Manufacturers Association (The) <a href="http://www.naima.org">www.naima.org</a>	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. <a href="http://www.nbgqa.com">www.nbgqa.com</a>	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) <a href="http://www.ncaa.org">www.ncaa.org</a>	(317) 917-6222
NCMA	National Concrete Masonry Association <a href="http://www.ncma.org">www.ncma.org</a>	(703) 713-1900
NEBB	National Environmental Balancing Bureau <a href="http://www.nebb.org">www.nebb.org</a>	(301) 977-3698
NECA	National Electrical Contractors Association <a href="http://www.necanet.org">www.necanet.org</a>	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association <a href="http://www.nelma.org">www.nelma.org</a>	(207) 829-6901

NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NGA	National Glass Association www.glass.org	(703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NOFMA	National Oak Flooring Manufacturers Association www.nofma.org	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	
NWWDA	National Wood Window and Door Association (Now WDMA)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
SAE	SAE International www.sae.org	(724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEI	Structural Engineering Institute	(800) 548-2723

	www.seinstitute.com	(703) 295-6195
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
UL	Underwriters Laboratories Inc. www.ul.com	(800) 285-4476 (847) 272-8800
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WIC	Woodwork Institute of California	

(Now WI)

- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

BOCA	BOCA International, Inc. (See ICC)	
CABO	Council of American Building Officials (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials  www.iapmo.org	(909) 472-4100
ICBO	International Conference of Building Officials (See ICC)	
ICBO ES	ICBO Evaluation Service, Inc. (See ICC-ES)	
ICC	International Code Council  (Formerly: CABO - Council of American Building Officials) www.iccsafe.org	(703) 931-4533
ICC-ES	ICC Evaluation Service, Inc.  www.icc-es.org	(800) 423-6587 (562) 699-0543
NES	National Evaluation Service (See ICC-ES)	
SBCCI	Southern Building Code Congress International, Inc. (See ICC)	

- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-6816
DOC	Department of Commerce www.commerce.gov	(202) 482-2000

DOD	Department of Defense www.dodssp.daps.mil	(215) 697-6257
DOE	Department of Energy www.eren.doe.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(202) 366-4000
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111 (202) 501-1888
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
MBC	Michigan Building Code	?????
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Building Service (See GSA)	
PHS	Office of Public Health and Science http://phs.os.dhhs.gov	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board www.nas.edu/trb	(202) 334-2934
USDA	Department of Agriculture	(202) 720-2791



www.usda.gov

USPS Postal Service  
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(202) 268-2000

- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

MDH Michigan Department of Health

?????

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 4200

SECTION 01 6000 - PRODUCT REQUIREMENTS  
- SUBSTITUTIONS AND OPTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Substitutions Request Procedures.
2. Product Substitutions and Options.
3. Substitution Request Form. (included at end of this Specification Section)

- B. Related Sections include the following:

1. Division 01 2100 Section "Allowances" for products selected under an allowance.
2. Division 01 4200 Section "References" for applicable industry standards for products specified.
3. Division 01 7700 Section "Closeout Procedures" for submitting warranties for contract closeout.
4. Divisions 02 0000 through 33 0000 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased 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, **except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise.** Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, 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. Substitutions (after selection of successful bidder): Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

#### 1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
  - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
  - 2. Form: Tabulate information for each product under the following column headings:
    - a. Specification Section number and title.
    - b. Generic name used in the Contract Documents.
    - c. Proprietary name, model number, and similar designations.
    - d. Manufacturer's name and address.
    - e. Supplier's name and address.
    - f. Installer's name and address.
    - g. Projected delivery date or time span of delivery period.
    - h. Identification of items that require early submittal approval for scheduled delivery date.
  - 3. Initial Submittal: Within thirty (30) calendar days after date of "Notice to Proceed," or date of commencement of work, submit three (3) copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
    - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
  - 4. Completed List: Within sixty (60) calendar days after date of "Notice to Proceed," submit three (3) copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
  - 5. Architect's Action: Architect will respond in writing to Contractor within fifteen (15) calendar days of receipt of completed product list. Architect's response will include a list of unacceptable product selections without explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

- B. Substitution Requests Procedures: Submit three (3) copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request must be proposed and submitted only to the Construction Manager or General Contractor. Substitution Requests must not be sent directly to the Architect.
  2. Substitution Request Form: Use form provided at end of Section.
  3. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified material or product cannot be provided.
    - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and other separate Contractors, that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
    - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution 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 lack of availability or delays in delivery.
    - j. Cost information, including a proposal of change, if any, in the Contract Sum.
    - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
    - l. 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.
  4. Architect/Engineer shall have right to reject proposed substitution without explanation.
  5. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within Seven (7) calendar days of receipt of a request for substitution. Architect will notify General Contractor or Construction Manager of acceptance or rejection of proposed substitution within Ten (10) calendar days of receipt of request, or Seven (7) calendar days of receipt of additional information or documentation, whichever is later.
    - a. **Should the Architect not respond within Twelve (12) calendar days of the dated date of Request, the proposed substitution is considered REJECTED.**
    - b. Form of Acceptance: Construction Change Directive (CCD).
    - c. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

d. Owner or Architect does not have to give any reason for rejection of substitutions.

- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 3300 Section "Submittal Procedures." Show compliance with requirements.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

## 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. Comply with manufacturer's written instructions.
1. 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.
  2. 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.
  3. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
  4. Store products to allow for inspection and measurement of quantity or counting of units.
  5. Store materials in a manner that will not endanger Project structure.
  6. Store products that are subject to damage by the elements, under cover in a weather-tight enclosure above ground, with ventilation adequate to prevent condensation.
  7. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  8. Protect stored products from damage.
- B. Owner's Storage Area: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

## 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 0000 through Divisions 33 0000 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in the following:

1. Division 01 3300 Section "Submittal Procedures."
2. Division 01 7700 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT OPTIONS and SUBSTITUTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that 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 not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product acceptable to the Architect.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
  - a. The product is a single source item.  
Substitutions will not be considered.
2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
  - a. Substitutions may be considered.

3. **Manufacturer's Products:** Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
  - a. Substitutions will not be considered.
4. **Manufacturers:** Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
  - a. Substitutions by non-listed manufacturers will not be considered.
5. **Product Options:** Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by a specified manufacturer. Comply with provisions in "Product Substitutions" Article.
6. **Basis-of-Design Products:** Where Specification paragraphs or subparagraphs titled "Basis-of-Design Product" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, design profiles, dimensions, and other characteristics that are based on the product named.
  - a. Provide Basis-of Design product or by one of the listed manufacturers.
  - b. Substitutions of other products will not be considered.
7. **Visual Matching Specification:** Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
  - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
8. **Visual Selection Specification:** Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
  - a. **Standard Range:** Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
  - b. **Full Range:** Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
9. **Allowances:** Refer to individual Specification Sections and "Allowance" provisions in Division 01 2100 for allowances that control product selection and for procedures required for processing such selections.

## 2.2 PRODUCT SUBSTITUTIONS CRITERIA

- A. Timing: Architect may consider requests for substitution if received within thirty (30) calendar days after the "Notice to Proceed" or before the first (1<sup>st</sup>) "Application for Payment." Requests received after that time may be considered or rejected at discretion of Architect without explanation.
  
- B. 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 or reason, except to record noncompliance with these requirements:
  - 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  - 2. Requested substitution does not require extensive revisions to the Contract Documents.
  - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - 4. Substitution request is fully documented and properly submitted.
  - 5. Requested substitution will not affect work of other Trades Contractor's construction time schedule.
  - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - 7. Requested substitution is compatible with other portions of the Work.
  - 8. Requested substitution has been coordinated with other portions of the Work.
  - 9. Requested substitution provides specified warranty.
  - 10. 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.

## 2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name (except noted as "basis-of-design), submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
  - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  - 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.

## PART 3 - EXECUTION (Not Used)

- 3.1 Architect's "Substitution Request" form included at end of this Specification Section.



END OF SECTION 01 6000



architects planners interiors

FRENCH  
associates

# SUBSTITUTION REQUEST

Project: \_\_\_\_\_

Substitution Request Number: \_\_\_\_\_

\_\_\_\_\_

From: \_\_\_\_\_

To: \_\_\_\_\_

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

\_\_\_\_\_

A/E Project Number: \_\_\_\_\_

Re: \_\_\_\_\_

Contract For: \_\_\_\_\_

Specification Title: \_\_\_\_\_

Description: \_\_\_\_\_

Section: \_\_\_\_\_ Page: \_\_\_\_\_

Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_

Installer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_

History:  New product  2-5 years old  5-10 yrs old  More than 10 years old

Differences between proposed substitution and specified product: \_\_\_\_\_

\_\_\_\_\_

Point-by-point comparative data attached - < REQUIRED BY A/E >

Reason for not providing specified item: \_\_\_\_\_

\_\_\_\_\_

Similar Installation:

Project: \_\_\_\_\_ Architect: \_\_\_\_\_

Address: \_\_\_\_\_ Owner: \_\_\_\_\_

\_\_\_\_\_ Date Installed: \_\_\_\_\_

Proposed substitution affects other parts of Work:  No  Yes; explain \_\_\_\_\_

\_\_\_\_\_

Savings to Owner for accepting substitution (if applicable): \_\_\_\_\_ (\$ \_\_\_\_\_).

Proposed substitution changes Contract Time:  No  Yes [Add] [Deduct] \_\_\_\_\_ days.

Supporting Data Attached:  Drawings  Product Data  Samples  Tests  Reports  
< REQUIRED BY A/E >

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

---

Submitted by: \_\_\_\_\_

Signed by: \_\_\_\_\_

Firm: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_

Attachments: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

---

A/E's REVIEW AND ACTION

**Note: Should the Architect not respond within Twelve (12) calendar days of the dated date of Request, the proposed substitution is considered rejected.**

- Substitution approved - Make submittals in accordance with Specification Section 01330.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_

Printed name: \_\_\_\_\_ Title: \_\_\_\_\_

---

Additional Comments:     Contractor     Subcontractor     Supplier     Manufacturer     A/E

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

cc:    Technical Specifications Committee

## SECTION 01 7300 - EXECUTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

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

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

- B. Related Sections include the following:

1. Division 01 3100 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 3300 Section "Submittal Procedures" for submitting surveys.
3. Division 01 7329 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 01 7700 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

#### 1.3 SUBMITTALS

- A. Qualification Data: For land surveyor or professional engineer.
- B. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two (2) copies signed by land surveyor and/or professional engineer.
- E. Final Property Survey: Submit five (5) copies showing the Work performed and record survey data.

#### 1.4 QUALITY ASSURANCE

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

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

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
    - a. Description of the Work.
    - b. List of detrimental conditions, including substrates.
    - c. List of unacceptable installation tolerances.
    - d. Recommended corrections.
  - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility, Owner and Architect that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. 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 to provide temporary utility services according to requirements indicated:
  - 1. Notify Owner and Architect not less than seven (7) calendar days in advance of proposed utility interruptions. Provide information on length of interruptions.
  - 2. Do not proceed with utility interruptions without Owner's and Architect's written permission.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. 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. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

### 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. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 3. Inform installers of lines and levels to which they must comply.
  - 4. Check the location, level and plumb, of every major element as the Work progresses.
  - 5. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
  - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

### 3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by **land surveyor** or **professional engineer** that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of **8 feet (2.4 m)** in spaces without a suspended ceiling.
- B. Building Envelope Integrity: The completed project must provide a building enclosure that does not allow water to penetrate the building envelope. Outside air infiltration into the building must be minimized unless controlled or part of hvac system operation. Outside air infiltration is not allowable in a quantity that can allow freezing or negatively impact piping (plumbing, fire protection, hvac), hvac systems, electrical systems or any other building system.
- C. Structural Integrity: All walls, ceilings, soffits and other components must be adequately supported to remain plumb and square. Provide bracing as required to prevent sway, cracking or collapse.
- D. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- E. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- F. 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.
- G. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- H. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- I. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 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.
- J. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- K. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.



### 3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold materials more than seven (7) calendar days during normal weather or three (3) calendar days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- 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 in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- 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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.7 STARTING AND ADJUSTING

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

- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 4000 Section "Quality Requirements."

### 3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 7329 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 7300

## SECTION 01 7329 - CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching of items indicated but not limited to the following:
  - 1. Architectural work.
- B. Related Sections include the following:
  - 1. Division 02 4119 Section "Selective Structure Demolition" for demolition of selected portions of the building.

#### 1.3 DEFINITIONS

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

#### 1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or results that increase maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

## 1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to 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.
  3. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate 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.
  4. 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, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 7329

## SECTION 01 7700 - CLOSEOUT 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. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion and Inspection procedures.
2. Final Completion and Inspection Procedures.
3. Warranties.
4. List of incomplete items (punch list).
5. Payment Procedures.
6. Project Record Documents.
7. Operation and maintenance manuals.
8. Demonstration and Training of Owner's Personnel.
9. Final Cleaning.

- B. Related Sections include, but not limited to the following:

1. Division 01 2900 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 01 7300 Section "Execution Requirements" for progress cleaning of Project site.
3. Divisions 02 0000 through Divisions 33 0000 Sections for specific closeout and special cleaning requirements for products of those Sections.

#### 1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  8. Complete startup testing of systems.
  9. Submit test/adjust/balance records.
  10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  11. Advise Owner of changeover in heat and other utilities.
  12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  13. Complete final cleaning requirements, including touchup painting.
  14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and Construction Manager 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. Reinspection: 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.

#### 1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
  2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report and warranty.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

## 1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within fifteen (15) calendar 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 the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) 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.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## 1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit two (2) copies 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.
  - 2. Organize items applying to each space by major element, including categories for ceiling, 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 and Construction Manager.
    - d. Name of Contractor.
    - e. Page number.

## 1.7 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's and Construction Manager's reference during normal working hours.
- B. Record As-Built Drawings: Maintain one (1) and submit one (1) set of black-line white prints of Contract Drawings and Shop Drawings to Architect.



1. 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 prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
    - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
  2. Mark record sets with non-erasable, red-colored ink. Use other colors to distinguish between changes for different categories of the Work at the same location.
  3. Mark important additional information that was either shown schematically or omitted from original Drawings.
  4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
  5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Submit one (1) CAD Disk of Record As-Built Floor Plans with all changes.
- D. Record Specifications: Submit one (1) copy of Project's Specifications, including addenda and contract modifications. Mark copy 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. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Note related Change Orders, Record Drawings, and Product Data, where applicable.
- E. Record Product Data: Submit one (1) copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
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 Drawings, and Record Specifications, where applicable.
- F. Miscellaneous Record Submittals: 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.

## 1.8 OPERATION AND MAINTENANCE MANUALS

- A. Assemble and submit one (1) complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Manuals:
    - a. Emergency and Standard instructions and procedures.
    - b. System, subsystem, and equipment descriptions, including operating standards.
    - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
    - d. Description of controls and sequence of operations.
    - e. Piping diagrams.
  2. Emergency Manuals:
    - a. Types of Emergencies: Fire, Flood, Gas leak, Electrical Power Outage, Chemical, Equipment failure and etc.
    - b. Instructions and Procedures for Shut-Down and Start-Up.
  3. Maintenance Data:
    - f. Manufacturer's information, including list of spare parts.
    - g. Name, address, and telephone number of Installer or supplier.
    - h. Maintenance procedures.
    - i. Maintenance and service schedules for preventive and routine maintenance.
    - j. Maintenance record forms.
    - k. Sources of spare parts and maintenance materials.
    - l. Copies of maintenance service agreements.
    - m. Copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

## 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 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Provide instructors experienced in operation and maintenance procedures.
  - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
  - 3. Schedule training with Owner, through Construction Manager, with at least seven (7) calendar days' advance notice.
  - 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
  - 5. Submit two (2) copies of instructional and demonstration of training procedures.
  
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
  - 1. System design and operational philosophy.
  - 2. Review of documentation.
  - 3. Operations.
  - 4. Adjustments.
  - 5. Troubleshooting.
  - 6. Maintenance.
  - 7. Repair.

### 3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations and all other governing agencies having jurisdiction on the project.
  
- 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 portion of Project as acceptable to the Architect.
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, 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 neither planted nor 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.
  - h. Sweep concrete floors broom clean in unoccupied spaces.
  - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
  - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - k. Remove labels that are not permanent.
  - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  - m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - n. Replace parts subject to unusual operating conditions.
  - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
  - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Submit a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 7700

## SECTION 03 3000 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls.
  - 3. Slabs-on-grade.
  - 4. Concrete curing process and procedures.
  - 5. Curing compounds, sealers and hardeners.
  - 6. Under-slab vapor barriers.
- B. Related Sections:
  - 1. Division 01 Section "Unit Prices" for unit pricing requests specified in this section.
  - 2. Division 01 Section "Alternates" for alternatives which affect this section.
  - 3. Division 07 Section "Building Insulation" for underslab insulation.
  - 4. Division 07 Section "Under-Slab Vapor Barrier" for vapor membrane under concrete slabs.
  - 5. Division 09 Sections for requirements relating specified floor coverings to finishing and curing of interior concrete floor slabs.
  - 6. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.

#### 1.3 DEFINITIONS

- A. Action Submittals: Mandatory submittals by the Sub-Contractor which require action on the part of the General Contractor, Construction Manager and Design Professional.
  - 1. General Contractor and Construction Manager: Review, Stamp and Forward to the Design Professional.
  - 2. Design Professional: Review, Stamp and Return to the General Contractor or Construction Manager.
- B. Informational Submittals: Mandatory submittals by the Sub-Contractor to the General Contractor, Construction Manager and Design Professional which are not returned but kept by each for their project record.
- C. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

#### 1.4 ACTION SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure and/or floor slabs.
  - 1. Location of construction joints is to be coordinated with control joint layout and is subject to approval of the Architect.
- E. Samples: For vapor barrier.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Qualification Data: For Installer and noted manufacturers.
- C. Product Data: For each type of product indicated or proposed for use on the project.
- D. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Steel reinforcement and accessories.
  - 4. Curing compounds.
  - 5. Floor and slab treatments.
  - 6. Bonding agents.
  - 7. Adhesives.
  - 8. Vapor barriers.
  - 9. Semi-rigid joint filler.
  - 10. Joint-filler strips.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates. **Note:** Prior to submittal of proposed mix designs, include aggregate supplier's service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity (AAR) or alkali silica reactivity (ASR).
- F. Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Services
  - 1. The Construction Manager/Owner will secure and pay for the services of a qualified, independent materials engineer to perform quality assurance testing of concrete materials, to confirm re-bar placement, to verify compliance of materials with specified requirements, and to perform required field and laboratory testing. Testing Agency shall be acceptable to the architect and the owner and shall be licensed to practice in the state in which the project is located.
  - 2. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
  - 3. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. CRSI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. MSP-1, "Manual of Standard Practice."
- G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
  - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete subcontractor.
    - e. Special concrete finish subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, vapor-barrier installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

#### 1.8 PROJECT CONDITIONS

- A. Cold-Weather Concreting: Comply fully with the recommendations of ACI 306.
  1. Well in advance of proposed concreting operations, advise the architect of planned protective measures including but not limited to heating of materials, heated enclosures, and insulating blankets.
- B. Hot-Weather Concreting: Comply fully with the recommendations of ACI 306.
  1. Well in advance of proposed concreting operations, advise the architect of planned protective measures.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Products: Subject to compliance with requirements, provide one of the products specified.
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

#### 2.2 FORM-FACING MATERIALS

- A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  1. Formulate form-release agent with rust inhibitor for steel form-facing materials.



- C. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

## 2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

~~B. Plain-Steel Wire: ASTM A 82, as drawn.~~

~~C.B.~~ Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars 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. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

## 2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I, II or III. At contractor's option supplement with the following (only if historical mix design break data is available for submittal):
    - a. Fly Ash: ASTM C 618, Class C or F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
  - 2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag cement.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded - typical except for architecturally exposed concrete. Provide Class 5S for architecturally exposed concrete. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
  - 1. Foundations, Walls and Piers: Nominal Maximum Aggregate Size: 1-1/2 inches.
  - 2. Floor Slabs on Grade: Nominal Maximum Aggregate Size: 1 inch.
- C. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M and potable.

## 2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Water Vapor Reducing Admixture
  - 1. At all exterior stairs and ramps and locations indicated on drawings, include Vapor Lock 20/20 admixture as part of concrete mix.
    - a. Manufacturer: Specialty Products Group, Smithville, Ontario
    - b. Sales Representative: ConTech Sales Group, Rochester Hills, MI. Phone: 248-318-4880.
    - c. Follow manufacturers recommendations for concrete mix.

## 2.7 VAPOR BARRIERS

- A. Vapor Barrier must meet or exceed the following standards:
  - 1. ASTM E 1745, Class B or better.
  - 2. ASTM E 96 Water Vapor Transmission Rate: Less than or equal to 0.007 Grains/Ft.<sup>2</sup>/Hr.
- B. Available Products:
  - 1. "Stego Wrap 15 Mil. Vapor Barrier" by Stego Industries: (877) 464-7843
  - 2. "Vaporguard" by Reef Industries: (713) 507-4251
  - 3. "Perminator 15 Mil. Under-slab Vapor Barrier" by W.R. Meadows: (800) 214-2100
  - 4. "Reflex 275" by Carlisle Coatings & Waterproofing: (800) 527-7092
- C. Accessories
  - 1. Manufacturer's recommended pressure-sensitive seam tape.
  - 2. Manufacturer's recommended vapor-proofing mastic.
  - 3. Pipe Boots: Construct penetration seals from vapor barrier material, pressure-sensitive seam tape and/or mastic in accordance with the manufacturer's instructions.
- D. Granular Sub-Base: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve..

## ~~2.8 FLOOR AND SLAB TREATMENTS~~

- ~~A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not~~

~~less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing 3/8-inch sieve, unless otherwise indicated.~~

~~1. Products: Subject to compliance with requirements, provide one of the following-~~

- ~~a. Anti-Hydro International, Inc.; Emery.~~
- ~~b. Dayton Superior Corporation; Emery Non-Slip.~~
- ~~c. Emeri-Crete, Inc.; Emeri-Topcrete.~~
- ~~d. Lambert Corporation; EMAG-20.~~
- ~~e. L&M Construction Chemicals, Inc.; Grip It.~~
- ~~f. Metalcrete Industries; Metco Anti-Skid Aggregate.~~

~~B. Un-pigmented Mineral Dry Shake Floor Hardener: Factory packaged dry combination of portland cement, graded quartz aggregate, and plasticizing admixture.~~

~~1. Products: Subject to compliance with requirements, provide one of the following-~~

- ~~a. Burke by Edoco; NonMetallic Floor Hardener.~~
- ~~b. ChemMasters; Concolor.~~
- ~~c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Conshake 500.~~
- ~~d. Dayton Superior Corporation; Quartz Tuff.~~
- ~~e. Euclid Chemical Company (The); Surfex.~~
- ~~f. Kaufman Products, Inc.; Tycron.~~
- ~~g. Lambert Corporation; Colorhard.~~
- ~~h. L&M Construction Chemicals, Inc.; Quartzplate FF.~~
- ~~i. MBT Protection and Repair, Div. of ChemRex; Maximent.~~
- ~~j. Metalcrete Industries; Floor Quartz.~~
- ~~k. Scofield, L. M. Company; Lithochrome Color Hardener.~~
- ~~l. Symons Corporation, a Dayton Superior Company; Hard Top.~~
- ~~m. Vexcon Chemicals, Inc.; Durag Premium.~~

~~C. Penetrating Liquid Floor Treatment (noted on architectural drawings as Concrete Hardener and Sealer): Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.~~

~~1. Products: Subject to compliance with requirements, provide one of the following-~~

- ~~a. Burke by Edoco; Titan Hard.~~
- ~~b. ChemMasters; Chemisil Plus.~~
- ~~c. ChemTec International; ChemTec One.~~
- ~~d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Intraseal.~~
- ~~e. Curecrete Distribution Inc.; Ashford Formula.~~
- ~~f. Dayton Superior Corporation; Day-Chem Sure Hard.~~
- ~~g. Euclid Chemical Company (The); Euco Diamond Hard.~~
- ~~h. Kaufman Products, Inc.; SureHard.~~
- ~~i. L&M Construction Chemicals, Inc.; Seal Hard.~~
- ~~j. Meadows, W. R., Inc.; Liqui-Hard.~~
- ~~k. Metalcrete Industries; Floorsaver.~~
- ~~l. Nox-Crete Products Group, Kinsman Corporation; Duranox.~~
- ~~m. Symons Corporation, a Dayton Superior Company; Buff Hard.~~
- ~~n. US Mix Products Company; US Spec Industraseal.~~

~~e. Vexcon Chemicals, Inc.; Vexcon StarSeal PS.~~

### 2.92.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, provide one of the following-
    - a. Axim Concrete Technologies; Cimfilm.
    - b. Burke by Edoco; BurkeFilm.
    - c. ChemMasters; Spray-Film.
    - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
    - e. Dayton Superior Corporation; Sure Film.
    - f. Euclid Chemical Company (The); Eucobar.
    - g. Kaufman Products, Inc.; Vapor Aid.
    - h. Lambert Corporation; Lambco Skin.
    - i. L&M Construction Chemicals, Inc.; E-Con.
    - j. MBT Protection and Repair, Div. of ChemRex; Confilm.
    - k. Meadows, W. R., Inc.; Sealtight Evapre.
    - l. Metalcrete Industries; Waterhold.
    - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
    - n. Sika Corporation, Inc.; SikaFilm.
    - o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
    - p. Unitex; Pro-Film.
    - q. US Mix Products Company; US Spec Monofilm ER.
    - r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, non-dissipating and compatible with new floor finishes.
1. Products: Subject to compliance with requirements, provide one of the following-
    - a. Anti-Hydro International, Inc.; AH Clear Cure WB.
    - b. Burke by Edoco; Spartan Cote WB II.
    - c. ChemMasters; Safe-Cure & Seal 20.
    - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
    - e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
    - f. Euclid Chemical Company (The); Aqua Cure VOX.
    - g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
    - h. Lambert Corporation; Glazecote Sealer-20.
    - i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
    - j. Meadows, W. R., Inc.; Vocomp-20.
    - k. Metalcrete Industries; Metcure.

- l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
- m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
- n. Tamms Industries, Inc.; Clearseal WB 150.
- o. Unitex; Hydro Seal.
- p. US Mix Products Company; US Spec Hydrasheen 15 percent
- q. Vexcon Chemicals, Inc.; Starseal 309.

#### 2.102.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- ~~C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.~~
- ~~D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:~~
  - ~~1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.~~

#### 2.11 REPAIR MATERIALS

- ~~A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.~~
  - ~~1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.~~
  - ~~2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.~~
  - ~~3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.~~
  - ~~4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.~~
- ~~B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.~~
  - ~~1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.~~
  - ~~2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.~~
  - ~~3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.~~
  - ~~4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.~~

#### 2.122.10 CONCRETE MIXTURES, GENERAL

- A. Review: Do not begin concrete operations until proposed mix has been reviewed by architect.
- B. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- C. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
  - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
- D. Mix design submittal shall include:
  - 1. Project name
  - 2. Project component which pertains to submitted mix design
  - 3. Admixtures
  - 4. Historical break data from past projects on which the proposed mix was used
  - 5. General Contractor or Construction Manager review stamp
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash: 25 percent.
  - 2. Combined Fly Ash and Pozzolan: 25 percent.
  - 3. Ground Granulated Blast-Furnace Slag: 25 percent.
  - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 75 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
  - 5. Note that fly ash and slag may not be used in any interior or exterior slab on grade or any exposed concrete areas.
- F. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- G. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing or high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.
  - 4. Use air-entraining admixture in exterior exposed concrete.
  - 5. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

#### 2.132.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Foundation Walls: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 3000 psi at 28 days.
  - 2. Minimum cement content – 470 # /cy, Maximum W/C 0.58

3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
- B. Slabs-on-Grade (Interior): Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3500 psi at 28 days.
  2. Minimum cement content – 517 # /cy, Maximum W/C 0.53
  3. Slump Limit: 4 inches, plus or minus 1 inch.
  4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
- C. Exterior Exposed Concrete: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: ~~4000~~ 4500 psi at 28 days.
  2. Minimum cement content – 564 # /cy, Maximum W/C 0.45
  3. Slump Limit: 4 inches.
  4. Air Content: 6 percent, plus or minus 1.0 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
  5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.
- D. Mix Adjustments: Provided that no additional expense to owner is involved, contractor may submit for architect's review requests for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

#### 2.142.12 FABRICATING REINFORCEMENT

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

#### 2.152.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

### PART 3 - EXECUTION

#### 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:



1. Class A, 1/8 inch for smooth-formed finished surfaces.
  2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
  2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Chamfer exterior corners and edges of permanently exposed concrete.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.



- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.4 VAPOR BARRIERS

- A. Vapor Barriers: Place, protect, and repair vapor barriers according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
  - 2. Place vapor barrier sheeting with the longest dimension parallel with the direction of the concrete pour.
  - 3. Seal all penetrations using site constructed boots, mastic, pressure-sensitive tape, etc.
- B. Course Graded Granular Sub-Base: Install over rough graded building pad.
- C. Coordinate installation of vapor barrier and use of blotter course and/or capillary break course with the anticipated construction schedule and ACI 302.1R-96, Figure 1. Plan sufficient time into the project schedule to allow for complete slab curing and drying in order to receive moisture sensitive floor finishes.
- D. If the roofing membrane has been installed on the building, the vapor barrier must be placed under a granular blotter course of fine-graded granular material.
  - 1. Fine-Graded Granular Blotter Course: Cover vapor barrier with a 3 inch layer of fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.
- E. If the roofing membrane has not been installed, the vapor barrier may be placed directly underneath the slab concrete on top of a capillary break course of fine graded material.
  - 1. Fine-Graded Granular Capillary Break Course: Install vapor barrier over a 3 inch layer of fine-graded granular material, moistened and compacted with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

### 3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Interrupt placement sequence as needed for practical or logistical placement. Install construction joints such that strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
  - 3. Locate joints for beams, slabs, joists, and girders in the middle third 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. If not indicated, locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  - 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction (Control) Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
  - 1. General: Install and locate joints in concrete slabs according to concrete institute standards and where indicated in the Drawings.
    - a. Drawing locations are schematic.
    - b. Review and coordinate exact locations with the Architect and proposed joints in finish materials.
  - 2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  - 3. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: 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.

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 Division 07 Section "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: 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.

### 3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect as part of the original mix design review process.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
    - a. ~~Monitor floor structure deflection during placement and supply concrete in sufficient quantity necessary to achieve specified floor elevations.~~
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING - GENERAL

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING - FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings or mortar setting beds for ceramic or quarry tile, portland cement terrazzo or other bonded cementitious floor finishes.

~~C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.~~

- ~~1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.~~

~~D.C.~~ Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. For distinct rooms or areas greater than 1,500 square feet: Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
  - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
3. For distinct rooms or areas less than 1,500 square feet: Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 3/16 inch

~~E.~~ Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. ~~Comply with flatness and levelness tolerances for trowel finished floor surfaces.~~

~~F.D.~~ Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

~~G.~~ Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

1. ~~Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.~~
2. ~~After broadcasting and tamping, apply float finish.~~
3. ~~After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.~~

~~H.~~ Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:

1. ~~Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer.~~
2. ~~Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.~~

~~3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.~~

~~Raked Groove Surface Finish: Install at interior and exterior vehicular traffic ramps and other sloped surfaces where indicated. Provide a ¼ inch deep grooved in a direction to control water downward to the sides/curbs of the slope. Prior to construction, review with Architect for acceptable interpretation of requirements.~~

### 3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- ~~B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.~~

### 3.11 CONCRETE PROTECTING AND CURING - GENERAL

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Slab on grade to receive rubber, resilient, vct or epoxy flooring must comply with the following requirement prior to flooring installation.
  - 1. Valid and acceptable test results shall be provided to the end user and flooring installer, including the location of all tests, recorded moisture content and temperature of the concrete subfloor prior to flooring installation. Testing shall be confirmed to have been performed at the correct, controlled ambient surface temperature and humidity following the protocol of ASTM F2170- Standard Test Method for determining Relative Humidity in Concrete Floor Slabs Using in situ Probes, using a Wagner Rapid RH probes only. When tested at the correct service temperature and ambient humidity the maximum allowable shall be 85% RH.
    - a. Testing may be performed by the flooring installer.
- D. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs on temporary formwork, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- E. Unformed Surfaces: Begin curing immediately after finishing concrete.
- F. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
  - a. Water.
  - b. Continuous water-fog spray.
  - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### 3.12 CONCRETE PROTECTING AND CURING – INTERIOR FLOORS AND SLABS

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Flatwork: Begin curing floors, slabs and concrete floor toppings immediately after finishing concrete.
- D. Cure concrete according to ACI 308.1 by:
  1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for three to seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    - a. Use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

### ~~3.13 LIQUID FLOOR TREATMENTS (CONCRETE HARDENER AND SEALER)~~

- ~~A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.~~
  - ~~1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.~~



- ~~2. Do not apply to concrete that is less than seven days' old.~~
- ~~3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.~~
- ~~4. Install concrete hardener and sealer at all exposed floor surfaces where floors do not receive other finished material.~~

~~B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.~~

### 3.143.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  1. Defer joint filling until concrete has aged at least six month(s) or as long as possible given the project schedule. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.153.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.



- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through un-reinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.163.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Construction Manager/Owner will engage a special inspector and/or a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
1. Steel reinforcement placement.
  2. Verification of use of required design mixture.
  3. Concrete placement, including conveying and depositing.
  4. Curing procedures and maintenance of curing temperature.

- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
  2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
  5. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
  7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
  8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
  9. Test results and Inspection Reports shall be reported in writing to Architect, concrete supplier / manufacturer, Contractor, and Authorities having jurisdiction within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  10. Non-destructive 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.
  11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  13. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 03 3000

## SECTION 04 20 00 - UNIT MASONRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
  - 1. Concrete masonry units.
  - 2. Face brick types (Refer to Drawings).
  - 3. Joint Types.
  - 4. Mortar and grout.
  - 5. Reinforcing steel.
  - 6. Masonry joint reinforcement.
  - 7. Ties and anchors.
  - 8. Embedded metal and thru-wall membrane flashing materials.
  - 9. Miscellaneous masonry accessories.
  - 10. Thermal Insulation.
  - 11. Temporary bracing of masonry walls.
- B. Related Sections include the following:
  - 1. Division 04 Section "Cast Stone Masonry" for caststone units.
  - 2. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
  - 3. Division 07 Section "Joint Sealants" for control joints and expansion joints.
- C. Products furnished, but not installed, under this Section include the following:
  - 1. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 05 Section "Structural Steel Framing."
- D. Products installed, but not furnished, under this Section include the following:
  - 1. Stone or cast-stone trim, furnished under Division 04 Section "Cast Stone Masonry."
  - 2. Steel lintels and shelf angles for unit masonry, furnished under Division 05 Section "Metal Fabrications."
  - 3. Manufactured reglets in masonry joints for metal flashing, furnished under Division 07 Section "Sheet Metal Flashing and Trim."

#### 1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths ( $f'_m$ ) at 28 days.
- B. Determine net-area compressive strength ( $f'_m$ ) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in Section 1.4 of the ACI 530.1/ASCE 6/TMS 602 Specification for Masonry Structures (the **MSJC Code**). Provide  $f'_m$  for concrete masonry construction according to the following:

Use	Compressive Strength, $f'_m$ (psi)	Unit Strength (psi)	Grout Strength (psi)	Mortar Type
Typical, unless noted otherwise	1500 min.	1900 min.	2000 min.	M or S
Walls, Piers, Pilasters > 24 ft. high	2000 min.	2800 min.	2500 min.	M or S
Columns	2500 min.	3750 min.	3000 min.	M or S

C. Masonry Inspection Requirements:

- 1. **[Testing Frequency for Non-Essential Facilities - Level B Quality Assurance:**
  - a. **Assurance level to be in accordance with Table 4 of the MSJC Specification for Masonry Structures.**
  - b. **Frequency level for Category I, II or III buildings to be in accordance with Table 1704.5.1 Level 1 Special Inspections of the Michigan Building Code.]**
- 2. **[Testing Frequency for Essential Facilities - Level C Quality Assurance:**
  - a. **Assurance level to be in accordance with Table 5 of the MSJC Specification for Masonry Structures.**
  - b. **Frequency level for Category IV buildings to be in accordance with Table 1704.5.3 Level 2 Special Inspections of the Michigan Building Code.]**
- 3. For this project, the testing and inspecting agency will be hired by the Owner or the Owner's representative.
- 4. Contractor may retain a qualified consultant to review procedures and construction methods to comply with this specification, industry standards and construction codes.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

- B. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- C. Shop Drawings: Show fabrication and installation details for the following:
1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
  2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- D. Samples for Verification: For the following:
1. Full-size units, if requested, for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
  2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Provide mix data.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Each type of masonry unit required.
    - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
    - b. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
  2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
  3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in Section 1.4 of **the MSJC Code**.
  4. Each combination of masonry unit type and mortar type specified to be manufactured with integral water repellent.
  5. Each material and grade indicated for reinforcing bars.
  6. Each type and size of joint reinforcement.
  7. Each type and size of anchor, tie, and metal accessory.
- G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
  2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- H. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in Section 1.4 of **the MSJC Code**.

- I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.
- J. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with hot-weather requirements.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Services
  - 1. The Construction Manager/Owner will secure and pay for the services of a qualified, independent materials engineer to perform quality assurance testing of mortar and grout materials, to confirm re-bar and anchorage placement, to verify compliance of materials with specified requirements, to observe and document compliance with hot and cold weather construction methods, and to perform required field and laboratory testing. Testing Agency shall be acceptable to the architect and the owner and shall be licensed to practice in the state in which the project is located.
- B. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- C. Masonry Standard: Comply with **the MSJC Code** unless modified by requirements in the Contract Documents.
- D. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- E. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- F. Preconstruction Testing Service: Owner may engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
  - 1. Clay Masonry Unit Test: For each type of unit required, per ASTM C 67.
  - 2. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
  - 3. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
  - 4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
  - 5. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019.
- G. Construction Testing Service: Refer to Article 3.15 "Field Quality Control" herein.
- H. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1. UL-Design No. U905: 2 hour rating. 6" (5-5/8") nominal thick concrete block (CMU) bearing and non-bearing fire-rated wall construction.
  2. UL-Design No. U906: 2 hour rating. 8" (7-5/8") nominal thick concrete block (CMU) bearing and non-bearing fire-rated wall construction.
  3. UL-Design No. U907: 3 and 4 hour rating. 8" (7-5/8") nominal thick concrete block (CMU) non-bearing fire-rated wall construction. Comply with CMU fabrication criteria.
- I. Mockups: Before installing unit masonry, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Locate mockups in the locations as directed by Construction Manager or Architect.
  2. Build mockups for the following types of masonry in sizes approximately 48 inches (12 long by 48 inches high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
    - a. Typical exterior wall with lower corner of window opening framed with cast stone trim and through-wall flashing.
    - b. Provide through-wall flashing to 16 inches above the ground floor line.
    - c. Provide mortar-net at least 10 inches high or 4 inches (minimum) deep of washed pea gravel at the bottom of the weep hole line.
    - d. Provide at least 2 inches of rigid insulation on the back-up cavity CMU wall with all insulation joints taped.
  3. Notify Architect seven (7) calendar days in advance of dates and times when mockups will be constructed.
  4. Acceptance of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship and does not constitute approval of deviations from the Contract Documents.
- J. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination" for Project Meetings.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Store masonry units and other material accessories on elevated platforms in a dry location, cover tops and sides of stacks with waterproof sheeting, securely tied.
    1. Protect Type-1 concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
  - B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- 1.8 PROJECT CONDITIONS
- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover masonry when construction is not in progress.



- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three (3) calendar days after building masonry walls or columns.
  - C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with other installed materials.
  - D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with the cold-weather construction requirements contained in Section 1.8C of **the MSJC Code**.
1. General: Comply with the following construction procedures for masonry construction, based on air temperatures at time of installation. When the ambient temperature is below 40 degrees F, implement cold weather procedures and comply with the following:
    - a. Do not lay glass unit masonry.
  2. **Preparation** – comply with the following requirements prior to conducting masonry work:
    - a. Do not lay masonry units having either a temperature below 20 degrees F or containing frozen moisture, visible ice, or snow on their surface.
    - b. Remove visible ice and snow from the top surface of existing foundations and masonry to receive new construction. Heat and maintain these surfaces above freezing, using methods that do not result in damage.
  3. **Construction** – These requirements apply to work in progress and are based on ambient air temperatures. Do not heat water or aggregates used in mortar or grout above 140 degrees F. Comply with the following requirements during construction when the following ambient air conditions occur:
    - a. 40 degrees F to 32 degrees F:
      - 1) Mortar: Heat sand and mixing water to produce mortar with temperature between 40 degrees F and 120 degrees F at the time of mixing.
      - 2) Grout and Units: Heated materials not required unless temperature falls below 32 degrees F.
    - b. 32 degrees F to 25 degrees F:
      - 1) Mortar: Heat sand and mixing water to produce mortar with temperature between 40 degrees F and 120 degrees F. Maintain mortar temperature above 40 degrees F until used in masonry.
      - 2) Grout – Heat grout aggregates and mixing water to produce grout with temperature between 70 degrees F and 120 degrees F. Maintain grout temperature above 70 degrees F at the time of grout placement.
      - 3) Units – Heat units to a minimum temperature of 32 degrees F at the time of placement.
    - c. 25 degrees F to 20 degrees F:
      - 1) Mortar: Heat sand and mixing water to produce mortar with temperature between 40 degrees F and 120 degrees F. Maintain mortar temperature above 40 degrees F until used in masonry.

- 2) Grout – Heat grout aggregates and mixing water to produce grout with temperature between 70 degrees F and 120 degrees F. Maintain grout temperature above 70 degrees F at the time of grout placement.
  - 3) Units – Heat units to a minimum temperature of 40 degrees F at the time of placement.
  - 4) Provide wind breaks or enclosures when wind velocity exceeds 15 MPH.
  - 5) Heat constructed masonry to 40 degrees prior to grouting.
- d. 20 degrees F and below:
- 1) Mortar: Heat sand and mixing water to produce mortar with temperature between 40 degrees F and 120 degrees F. Maintain mortar temperature above 40 degrees F until used in masonry.
  - 2) Grout – Heat grout aggregates and mixing water to produce grout with temperature between 70 degrees F and 120 degrees F. Maintain grout temperature above 70 degrees F at the time of grout placement.
  - 3) Units – Heat units to a minimum temperature of 40 degrees F at the time of placement.
  - 4) Provide an enclosure with auxiliary heat to maintain air temperature of 32 degrees within the enclosure.
  - 5) Heat constructed masonry to 40 degrees prior to grouting.
- e. Grouted construction: On any day when the anticipated nighttime temperature is 32 degrees F or less, in addition to complying with general procedures above, heat grout materials between 90 degrees F and 120 degrees to produce in-place grout temperature of not less than 70 degrees F at end of work day.
- f. Clay masonry units: Comply with the following requirements for clay masonry units which must be wetted before laying because initial rate of absorption (suction) greater than 1 gram per square inch per minute (ASTM C 67):
- 1) Surface temperatures above 32 degrees F: Sprinkle with water heated to 70 degrees F or above, just before laying.
  - 2) Surface temperatures below 32 degrees F: Sprinkle with water heated to 130 degrees F or above, just before laying.
- g. Water: Do not heat water for mortar or grout to more than 160 degrees F.
- h. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and above and will remain so until masonry has dried, but not less than seven (7) calendar days after completing cleaning.
4. **Protection** – These requirements apply after masonry is placed and are based on anticipated minimum daily temperature. Protect completed masonry in the following manner:
- a. Maintain the temperature of unit masonry above 40 degrees F for the first 48 hours after construction.
  - b. 40 degrees F to 25 degrees F:
    - 1) Protect newly constructed masonry by covering with a weather-resistive membrane for 24 continuous hours after being completed.

- c. 25 degrees F to 20 degrees F:
    - 1) Cover newly constructed masonry completely with weather-resistive insulating blankets for 48 continuous hours.
  - d. 20 degrees F and below:
    - 1) Maintain newly constructed masonry temperature above 32 degrees F for at least 48 continuous hours after being completed by using heated enclosures and a continuous heat source such as heaters, electric heating blankets, infrared lamps, etc.
  - e. Grouted construction: On any day when the anticipated nighttime temperature is 32 degrees F or less, in addition to complying with general procedures above, provide insulating blankets and heated enclosures for not less than 72 continuous hours and longer if conditions threaten completed work.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Comply with the hot-weather construction requirements contained in Section 1.8D of **the MSJC Code**.
- 1. General: Comply with the following construction procedures for masonry construction, based on air temperatures at time of installation. When the ambient temperature is 100 degrees F, or exceeds 90 degrees F with a wind velocity greater than 8 MPH implement hot weather procedures and comply with the following:
  - 2. **Preparation** – comply with the following requirements prior to conducting masonry work:
    - a. Maintain sand piles in a damp, loose condition.
    - b. Provide necessary conditions and equipment to produce mortar having a temperature below 120 degrees F.
    - c. When the ambient temperature exceed 115 degrees F, or exceeds 105 degrees F with a wind velocity greater than 8 MPH, shade materials and mixing equipment from direct sunlight.
  - 3. **Construction** – These requirements apply to work in progress and are based on ambient air temperatures. Comply with the following requirements during construction when the following ambient air conditions occur:
    - a. When the ambient temperature is 100 degrees F, or exceeds 90 degrees F with a wind velocity greater than 8 MPH:
      - 1) Maintain temperature of mortar and grout below 120 degrees F.
      - 2) Flush mixer, mortar transport container, and mortar boards with cool water before they come in contact with mortar ingredients or mortar.
      - 3) Maintain mortar consistency by re-tempering with cool water.
      - 4) Use mortar within 2 hours of initial mixing.

- 5) Do not spread mortar beds more than 48 inches ahead of units. Set masonry units within one minute of spreading mortar.
- b. When the ambient temperature exceed 115 degrees F, or exceeds 105 degrees F with a wind velocity greater than 8 MPH:
  - 1) Implement the requirements of E.3.a above and use cool mixing water for mortar and grout. Ice is permitted in the mixing water prior to use. Do not permit ice in the mixing water when added to the other mortar or grout materials.
4. **Protection** – These requirements apply after masonry is placed and are based on the average daily temperature. Protect completed masonry in the following manner:
  - a. When the mean air temperature is 85 degrees F or above, if relative humidity is less than 30 percent or if wind velocity is in excess of 15 MPH:
    - 1) Provide protection by immediately covering newly constructed walls, by providing wind breaks, or by using fog spray to reduce rate of evaporation.
  - b. When the mean daily temperature exceeds 100 degrees F, or exceeds 90 degrees F with a wind velocity greater than 8 MPH:
    - 1) Fog spray newly constructed masonry until damp, at least three times a day until the masonry is three days old.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.
- B. Where CMU walls are to be painted, standard aggregate mix, color grey is acceptable.

### 2.2 CONCRETE MASONRY UNITS (CMUs)

- A. Shapes: Provide shapes indicated and as follows:
  1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  2. Provide bullnose units for outside corners, unless otherwise noted.
- B. CMU-1: Standard Finish Concrete Masonry Units - for interior locations only - comply with ASTM C 90 and as follows:
  1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength specified under the Performance Requirements of Article 1.4.B above.
  2. Weight Classification:

- a. Exterior Walls: Normal or Medium weight – Cavity/Veneer Walls Only
  - b. Exterior Walls: Normal weight – Singly Wythe Walls
  - c. Interior Load or Non-Load Bearing Walls: Normal or Medium weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
  4. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.
- C. CMU-2: Split-face Concrete Masonry Units: Comply with ASTM C-90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength specified under the Performance Requirements of Article 1.4.B above.
  2. Weight Classification:
    - a. Exterior Walls: Normal or Medium weight – Cavity/Veneer Walls Only
    - b. Exterior Walls: Normal weight – Singly Wythe Walls
    - c. Interior Load or Non-Load Bearing Walls: Normal or Medium weight.
  3. Size: Manufactured to dimensions indicated for non-decorative units.
  4. Finish: Exposed faces of the following general description matching integral color, pattern, and texture **to match existing split face CMU.**
    - a. CMU-2: **Match existing split face CMU used in the existing vestibule.**
- D. CMU-3: Smooth-faced (Burnished) Concrete Masonry Units: Comply with ASTM C-90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength specified under the Performance Requirements of Article 1.4.B above.
  2. Weight Classification:
    - a. Exterior Walls: Normal or Medium weight – Cavity/Veneer Walls Only
    - b. Exterior Walls: Normal weight – Singly Wythe Walls
    - c. Interior Load or Non-Load Bearing Walls: Normal or Medium weight.
  3. Size: Manufactured to dimensions indicated for nondecorative units.
  4. Finish: Exposed faces of the following general description matching integral color, pattern, and texture **to match existing burnished CMU.**
    - a. CMU-3: **Match existing burnished CMU used in the existing vestibule**

## 2.3 CONCRETE AND MASONRY LINTELS

- A. General: Provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.
- B. Precast Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 03 Section "Cast-in-Place Concrete." Use in hidden or un-exposed conditions only.
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.4 BRICK

- A. General: Provide shapes indicated and as follows:

- 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
- 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
- 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
- 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- 5. Out-of-Tolerance, warped and damaged brick shall not exceed five (5) per cent of the brick delivered to the project. Brick manufacturer and brick supplier shall provide additional material to the project at no additional cost to the Project.

- B. Face Brick: Grade SW, Type FBX, and as follows:

- 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi
- 2. Initial Rate of Absorption: Less than 20 g/30 sq. in. per minute when tested per ASTM C 67.
- 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
- 4. Surface Coloring: Brick with surface coloring, other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet.

- C. Face Brick Types Schedule:

- 1. General:
  - a. Special shapes: Provide specially molded units as required to meet conditions indicated, unless standard units can be sawn to produce the same effect. Do not use standard units in any configuration which exposes cores or frogging.
- 2. Face Brick – Type BR-1:
  - a. Architectural Face Brick, **match existing brick used in the existing vestibule**

## 2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold-weather construction.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- D. Mortar Cement: ASTM C 1329.
- E. Masonry Cement: ASTM C 91.
  - 1. For pigmented mortar, use a colored cement formulation as required to produce the color indicated or, if not indicated, as selected from manufacturer's standard formulations.
  - 2. For colored-aggregate mortar, use natural color or white cement as necessary to produce required mortar color.
- F. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
  - 1. White-Mortar Aggregates: Natural white sand or ground white stone.
  - 2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C 404.
- H. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
  - 1. Products:
    - a. St. Mary's Cement Company.
    - b. Color Mortar Blend; Glen-Gery Corporation.
    - c. Rainbow Mortamix Custom Color Cement/Lime; Holnam, Inc.
    - d. Centurion Colorbond PL; Lafarge Corporation.
    - e. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
    - f. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).
    - g. Lafarge Mortar Cement; Lafarge Corp.
- I. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.
  - 1. Although ASTM C 270 appendix and BIA recommend against using any admixtures, a non-chloride, non-corrosive, accelerating admixture may be considered if submitted prior to masonry work proceeding, is demonstrated to be compatible with the proposed mortar mix design and is used consistently throughout the project.
  - 2. Accelerating admixture approval is contingent upon the following requirements:
    - a. Laboratory testing for compatibility with mortar mix used.

- b. Proportions and mix to comply with the admixture manufacturer's written instructions.
    - c. Admixture shall used throughout the Project so the mortar will be a consistent color.
  - 3. Product:
    - a. Euclid Chemical Company (The); Accelguard 80.
    - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
    - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- J. Water-Repellent Admixture: Liquid water-repellent mortar admixture is required in mortar joints for all CMUs containing integral water repellent. Mortar admixture is to be by the same manufacturer as the CMU admixture. Coordinate with CMU supplier prior to mixing mortar.
  - 1. Manufacturer's Product:
    - a. Acme Shield, Acme-Hardesty Co.
    - b. Block Plus W-10; Addiment Inc.
    - c. Dry-Block; W.R. Grace & Co., Construction Products Division.
    - d. Rheopel; Master Builders.
- K. Water: Potable.
- L. Un-coated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- M. Masonry Joint Reinforcement, General: ASTM A 951.
  - 1. Interior Walls: Mill- galvanized, carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
  - 3. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
  - 4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
  - 5. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
  - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- N. Masonry Joint Reinforcement, Stainless Steel: ASTM A 580, Type 304.
  - 1. Swimming Pool, Spa and Chemical Storage Room Walls: Stainless steel.
- O. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- P. Masonry Joint Reinforcement for Multi-wythe Masonry:
  - 1. Ladder type with perpendicular cross rods spaced not more than 16 inches o.c. and 1 side rod for each face shell of hollow masonry units more than 4 inches in width.
  - 2. Tab type, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least **5/8-inch** cover on outside face.
  - 3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular



to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

## 2.6 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Swimming Pool, Seating Area, Locker Room, Chemical Storage Room: Provide stainless steel tie and anchor sections on interior side of wall assembly.
  - 1. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 153, Class B-2 coating.
  - 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
  - 3. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
  - 4. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
  - 5. Stainless-Steel Sheet: ASTM A 666, Type 304.
  - 6. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  - 7. Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.

## 2.7 BENT WIRE TIES

- A. General: Rectangular units with closed ends and not less than 4 inches wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
  - 1. Where coursing between wythes does not align, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.
  - 2. Where wythes are of different materials, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.
- B. Wire: Fabricate from 3/16-inch-diameter, hot-dip galvanized steel wire.

## 2.8 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
  - 1. Anchor Section: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire anchor section for welding to steel.
  - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch- diameter, hot-dip galvanized steel wire.

## 2.9 FLEXIBLE ANCHORS FOR CONNECTING TO STEEL FRAME

- A. Flexible Anchors for Connecting to Structure: Provide two-piece assembly that allows vertical and horizontal movement but resists tension and compression forces perpendicular to plane of wall.

1. Anchor Section: 14 gauge or 1/8 inch thick by 7 inches high with 1inch bend for welding to beam. Slot for wire tie is 5 inches high positioned within 2 inches of the inside face of masonry.
    - a. Heckman # 308 Receptacle Slot Anchor or approved equal.
  2. Tie Section: Rectangular-shaped wire tie, 3 or 4 inches wide sized to extend within 2 inch of masonry face, made from 0.1875-inch-diameter, hot-dip galvanized steel wire.
    - a. Heckman # 314 Tie Clip Anchor or approved equal.
- B. Joint Stabilizing Anchors: Single-piece assembly with sliding rods held in receiver which allows vertical and horizontal movement but resists tension and compression forces perpendicular to plane of wall.
1. Receiver Section: Fabricated with stainless steel 1/32 inch sheet steel sleeves, one side embedded in masonry, the other connected to the steel frame with self tapping screws for full capacity of the anchor assembly.
  2. Tie Section: Two 8 gauge stainless wires encased in plastic sleeves held in the receiver section.
    - a. Dur-O-Wal # D/A 2200 or approved equal.

## 2.10 ANCHORS FOR CONNECTING TO CONCRETE

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section: Dovetail anchor section formed from 0.0528-inch- thick, steel sheet, galvanized after fabrication.
  2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch- diameter, hot-dip galvanized steel wire.

## 2.11 RIGID ANCHORS

- A. General: Fabricate from steel bars as follows:
1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.
  2. Finish: Hot-dip galvanized to comply with ASTM A 153.
  3. Weld to structural steel frame.

## 2.12 INTERSECTING WALL ANCHORS

- A. General: Fabricate steel bars as follows:
1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.
  2. Finish: Hot-dip galvanized to comply with ASTM A 153.
  3. Lay-up in alternate courses between adjacent intersection walls which are not interlocked or at control joint locations.

## 2.13 ADJUSTABLE MASONRY-VENEER ANCHORS

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
1. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
- B. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie section and a metal anchor section complying with the following requirements:
1. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section.
  2. Screw-Attached Masonry-Veneer Anchors Manufacturers:
    - a. D/A 210 with D/A 700-708; Dur-O-Wal, Inc.
    - b. 315-D with 316; Heckman Building Products, Inc.
    - c. DW-10HS; Hohmann & Barnard, Inc.
    - d. DW-10-X; Hohmann & Barnard, Inc.
    - e. RJ-711; Masonry Reinforcing Corporation of America.
- C. Slip-in, Masonry-Veneer Anchors: Units consisting of a wire tie section and a wire anchor section designed to be slipped into metal studs as sheathing is installed. Anchor section locks in place by fitting to inside of metal stud, and has an eye to receive the wire tie section. Wire tie section has a vertical leg that slips into the eye of the anchor section and allows vertical adjustment. Both sections are made from 3/16-inch, hot-dip galvanized wire.
1. Slip-in, Masonry-Veneer Anchors Manufacturers:
    - a. AA308; Hohmann & Barnard, Inc.
    - b. Other manufacturer acceptable to the Architect.
- D. Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion protective coating:
1. Organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
  2. Organic-Polymer-Coated, Steel Drill Screws Manufacturers:
    - a. Dril-Flex; Elco Industries, Inc.
    - b. Traxx; ITW-Buildex.
    - c. Other manufacturers acceptable to the Architect.

## 2.14 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.
- B. Dovetail Slots: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.0336-inch, galvanized steel sheet.

- C. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C.
- D. Post-installed Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Type: Expansion or Adhesive anchors.
  - 2. Type: Undercut anchors.
  - 3. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
  - 4. For Post-installed Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
  - 5. For Post-installed Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

## 2.15 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim" and below:
  - 1. Stainless Steel Flashing: Provide 0.0156 inch thick. Install where in direct contact with aluminum or stainless steel materials.
    - a. Provide at Fully-concealed and at Exposed locations.
  - 2. Copper Sheet Flashing: Provide as follows:
    - a. Fully concealed locations: Provide 10 oz. minimum.
    - b. Exposed and Visible Locations: Provide 16 oz. Minimum.
  - 3. Galvanized Steel Sheet: 0.22 inch.
  - 4. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above and with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond. Length of flashing shall be at least 4 inches past the opening and more to cover any lintels.
  - 5. Fabricate metal drip edges from sheet metal indicated above. Extend at least 3 inches into wall and 1/2 inch out from wall, with a hemmed outer edge bent down 30 degrees.
  - 6. Fabricate metal flashing terminations from sheet metal indicated above. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and then down into joint 3/8 inch to form a stop for retaining sealant backer rod.
  - 7. Provide and adhere metal water drip edge under flashing and projecting past face of masonry surface.
- B. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Metal Flashing Manufacturers: Manufacturers indicated in this part of the Specifications and other Manufacturers acceptable to the Architect.
- C. Partly-exposed Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above in "Embedded Flashing Materials." For flashing not exposed to the exterior elements, use one of the following, unless otherwise indicated:

1. Provide flashing as a complete system with preformed corners, end dams, other special shapes, and seaming materials; all produced by flashing sheet manufacturer.
2. Copper-Laminated Flashing: Manufacturer's laminated flashing consisting of 5 oz. sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
  - a. Copper Fabric Flashing; Advanced Building Products, Inc.
  - b. Copper Fabric; AFCO Products, Inc.
  - c. H & B C-Fab Flashing; Hohmann & Barnard, Inc.
  - d. Other manufacturer's products acceptable to the Architect.
3. Fully Concealed Thru-Wall Membrane Flashing: Contractor shall provide one of the flashing material types listed. Provide adhesive-set thru-wall membrane flashing at all masonry material types above foundation walls to at least 16 inches above the ground floor line. Install under window sills, lintels, parapet walls and at single-wythe Concrete Masonry Units above the foundation walls and other areas indicated. Provide water edge drip of compatible metal, adhered under the flashing and bent down the face of the masonry units to direct water away from the masonry joints.
  - a. Asphalt-Coated Copper Fabric Flashing: Manufacturer's adhesive-set sheet copper-coated with flexible asphalt.
    - 1) Copper Fabric Flashing; Advanced Building Products, Inc.
    - 2) York Copper Fabric Flashing; York Manufacturing, Inc.
    - 3) Other Manufacturer's Product acceptable to the Architect.
  - b. Rubberized-Asphalt Flashing: Manufacturer's composite flashing of adhesive-set rubberized-asphalt compound, bonded to high-density, cross-laminated polyethylene film. Note: Use only where flashing is fully concealed in masonry.
    - 1) Dur-O-Barrier; Dur-O-Wall, Inc.
    - 2) Perm-A-Barrier Wall Flashing; W.R. Grace & Co.
    - 3) Other Manufacturer's Product acceptable to the Architect.
  - c. Elastomeric Thermoplastic Flashing: Manufacturer's adhesive-set composite flashing consisting of a polyester-reinforced ethylene interpolymerally. Note: Use only where flashing is fully concealed in masonry.
    - 1) Hyload Flashing Membrane; Hyload Cloaked Flashing System.
    - 2) Other Manufacturer's Product acceptable to the Architect.
  - d. EPDM Flashing: Manufacturer's adhesive-set product formed from a terpolymer of ethylene-propylene diene, complying with ASTM D 4637, 0.040 inch thick, min. Note: Use only where fully concealed in masonry.
    - 1) FlashGuard; Firestone Building Products.
    - 2) Other Manufacturer's Product acceptable to the Architect.
- D. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.
- E. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."

- F. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
- G. Exposed Metal Drip Edges: All metal drip edges shall comply with the following: Hemmed exposed edges, laps utilizing non-skinned butyl sealant, and a compatible sealant where the underside of the hem transitions to the substrate below.

## 2.16 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from urethane.
- B. Preformed Control-Joint: Material designed to fit standard sash block and to maintain lateral stability in masonry wall and designed to allow for movement.
  - 1. PVC: ASTM D 2287, Type PVC-65406.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Cavity Drainage Material: Wall Drainage System: 1" thick x 10" high x continuous high density polyethylene or nylon mesh in trapezoidal configuration designed to allow moisture to flow downward in the cavity. Manufacturer's Product - Basis of Design: "The Mortar Net" by Mortar Net USA.
  - 1. Cavity Drainage Material Manufacturer:
    - a. Mortar Break; Advanced Building Products, Inc.
    - b. CavClear Masonry Mat; CavClear.
    - c. Mortar Net; Mortar Net USA, Ltd.
    - d. Mortar Stop; Polytite Manufacturing Corp.
- E. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.187-inch steel wire, hot-dip galvanized after fabrication.
  - 1. Provide units with either two loops or four loops as needed for number of bars indicated.
  - 2. Reinforcing Bar Positioners Manufacturer:
    - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
    - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
    - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
    - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
- F. Weep Hole Vent Inserts: Provide only where noted or indicated on Drawings.
  - 1. Brick and CMU Locations: Plastic Weep Hole/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, designed to fill open head joints with outside face held back 1/4 inch (6 mm) from exterior face of masonry. Color to match grout joint color. Size of weep slot shall be width of mortar joint and brick height. Install Weep Hole Vents at not more than 24 inches spacing.
    - a. Weep Hole Vent Manufacturers:

- 1) Dur-O-Wal, Inc.
  - 2) Advanced Building Products.
  - 3) Wire Bond.
  - 4) Sandell Manufacturing Company, Inc.
2. Stone Work Locations: Provide Cotton rope, ¼ inch to 3/8 inch diameter, in length required to extend at least 3 inches upward inside the cavity space and protruding at least 1 inch from the finished stone face. Remove cotton wick at completion of stone work.
- a. Locate cotton weeps at intersection of grout joints and elsewhere recommended for cavity relief according to Stone Work industry standards.
  - b. Stone Work materials are: Manufacturers fabricated or Cast Stone, Limestone, Marble, Granite, Travertine or other similar stone materials.
- G. Brick and CMU Brick Relief Vents: Provide one-piece extruded aluminum or flexible extrusion made from UV-resistant polyvinyl polymer louver type insert, designed to provide pressure equalization relief of the cavity space. Size of brick vent shall be width of mortar joint and brick height and flush with face of masonry. Color as selected from manufacturer's full range.
1. Install Brick Vents at locations only where noted or indicated in the Drawings.
  2. Brick Vent Manufacturers:
    - a. Hohmann & Barnard, Inc.
    - b. Williams Products, Inc.
    - c. Other manufacturers, acceptable to the Architect.

## 2.17 INSULATION

- A. Cavity Wall Insulation: Extruded polystyrene board insulation: ASTM C 578 of type and density indicated. Maximum flame-spread and smoke-developed indices of 75 and 45° respectively.
1. Rigid Insulation: Extruded polystyrene insulation by "Owens-Corning High-R, CW Plus" 2-1/8 inch thick R-12.0. (R=10.0 minimum requirement).
  2. Contractor's Option: "Dow-Styrofoam Cavitymate" ULTRA 2-1/8 inches thick, R=10.8. (R=10.0 minimum requirement).
- B. Foam Insulation: Install foam insulation in cells of concrete masonry units.
1. Install from interior side of masonry unit grout joints only.
  2. Fire safety according to ASTM E-84 and ASTM E-119.
  3. Density: Wet 2.5 to 0.9 lb/ft<sup>2</sup>.
  4. Water Absorption: Not to exceed 15%.
  5. Shrinkage: Not less than 4%.
  6. Insulation R Value: R = 9.0 minimum for 8 inch CMU.
- C. Masonry Cell Insulation: Provide at Single-Wythe CMU exterior walls.
1. Granular Loose-Fill Insulation: Perlite complying with ASTM C 549, Type II - surface treated for water repellency and limited moisture absorption and complying with flame-spread and smoke development.

2. Install loose-fill insulation at not more than four (4) feet in height during construction of CMU walls.

## 2.18 MASONRY CLEANERS

- A. Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
    - a. "Sure Klean No. 600 Detergent"; ProSoCo, Inc.
    - b. Other manufacturers complying with Specifications.

## 2.19 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  1. Do not use calcium chloride in mortar or grout.
  2. For exterior masonry and reinforced masonry, use portland cement-lime or mortar cement mortar.
  3. For un-reinforced masonry, use portland cement-lime, masonry cement or mortar cement mortar.
  4. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
  1. For masonry below grade or in contact with earth, use Type M.
  2. For reinforced or un-reinforced masonry not in contact with earth, use Type M or S.
  3. For mortar parge coats, use Type S.
  4. For interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N. Coordinate with architectural requirements for veneer mortars.
  5. Water-Repellent Admixture: Liquid water-repellent mortar admixture is required in mortar joints for all CMUs containing integral water repellent. Mortar admixture is to be by the same manufacturer as the CMU admixture. Coordinate with CMU supplier prior to mixing mortar. Water-repellant shall be supplied according to the manufacturer's recommendations in quantity sufficient to provide maximum water repelling qualities.
    - a. Manufacturer's Product:



- 1) Acme Shield, Acme-Hardesty Co.
- 2) Block Plus W-10; Addiment Inc.
- 3) Dry-Block; W.R. Grace & Co., Construction Products Division.
- 4) Rheopel; Master Builders.

D. Mortar/Grout Colors:

1. Provide standard grey matching concrete masonry unit colors unless otherwise indicated.
2. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 7 of the **MSJC Code** for dimensions of grout spaces and pour height. Fine grout shall not be used unless absolutely necessary to comply with Table 7.
2. Proportion grout in accordance with ASTM C 476, Paragraph 4.2.2 for specified 28-day compressive strength indicated by Article 1.4.B Performance Requirements of this specification.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

F. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's directions.

## 2.20 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.

C. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

## 2.21 FIELD APPLIED WATER REPELLENTS ON EXTERIOR MASONRY SURFACES

A. Provide penetrating water repellent coating at the following locations:

1. Install at exposed exterior masonry surfaces where single-wythe "integral water repellent concrete masonry units" are not indicated.
2. Install at all exposed CMU exterior masonry surfaces and other areas where indicated.

B. Provide clear penetrating water repellents on masonry surfaces in compliance with manufacturer's written instructions. Water repellents shall be Silanes or Siloxanes products with at least 20 % solids that can be applied to slightly damp surfaces.

1. Provide coating according to the manufacturer's recommendations and in quantity sufficient to provide maximum water repelling qualities.
  2. Provide a water repellent product with at least a ten (10) year warranty.
- C. Manufacturer's Product:
1. Prime-A-Pell Plus, ChemProbe/Tnemec Co., Inc.
  2. Other Manufacturer's products acceptable to the Architect.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Field apply water repellent on exterior surfaces of single-wythe masonry units' construction.
- C. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- D. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- E. Use full-size units without cutting. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
- G. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- H. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.
- I. Comply with construction tolerances in the **MSJC Code** and with the following:
  1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
  2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond and pattern indicated on Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- H. Install reinforcing bar positioners in locations coordinated with the vertical reinforcement spacing. Positioners shall be located accurately to install reinforcement bars in the center of the unit core or offset as specified on the Drawings.
- I. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items. Fill cores at anchors and embedded items.
- J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
  1. Install compressible filler in joint between top of partition and underside of structure above.

2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 8446 Section "Fire-Resistive Joint Systems."

### 3.4 MORTAR BEDDING AND JOINTING

#### A. Lay hollow masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

#### B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.

#### C. Set stone or cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

#### D. Mortar/Grout Joint Types: Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

1. Provide tooled joints (concave) unless otherwise indicated.
2. Other joint types – flushed, raked, struck will be indicated on the Drawings.

#### E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

### 3.5 COMPOSITE MASONRY

#### A. Bond wythes of composite masonry together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 4.5 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses.

2. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
    - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
  3. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
    - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
  4. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 8 inches clear horizontally and 16 inches clear vertically.
- B. Bond wythes of composite masonry together using bonding system indicated on Drawings.
- C. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.
- D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.
1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
- E. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
1. Provide individual metal ties not more than 8 inches o.c.
  2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.
  3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

### 3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
    - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
    - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
  - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
  - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
  - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
  - B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
  - C. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
    1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.
    2. Tape all insulation joints with Manufacturer's approved insulation tape.

### 3.7 MASONRY-CELL INSULATION

- A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to 1 story in height, but not more than 20 feet.
- B. Install molded-polystyrene insulation units into masonry unit cells before laying units.
- C. Inject foamed in-place insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each area. Close the ports after filling has been confirmed. Limit the fall of insulation to 1 story in height, but not more than 10 feet.

### 3.8 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  1. Space reinforcement not more than 16 inches o.c.
  2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
    - a. Reinforcement above is in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
  - 1. Provide an open space not less than 1 inch in width between masonry and structural member. Keep open space free of mortar or other rigid materials.
  - 2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches on-center vertically and 32 inches on-center horizontally.

### 3.10 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to **[ wall framing][ or][ concrete][ and]** masonry backup with masonry-veneer anchors to comply with the following requirements:
  - 1. **[Fasten screw-attached and seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.]**
  - 2. **[Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.]**
  - 3. Embed tie sections or connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
  - 4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  - 5. **[Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.]**
  - 6. Space anchors as indicated, but not more than 16 inches o.c. vertically and horizontally with not less than 1 anchor for each 3.5 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

### 3.11 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated in Drawings but not spaced more than 30'-0" apart. Build-in related items as masonry progresses. Do not form a continuous span through movement joints. Verify control joint locations with Architect.
- B. Form control joints in concrete masonry as follows using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Location and spacing of control joints shall comply with industry standards.

C. Form expansion joints in brick made from clay or shale as follows:

1. Build flanges of factory-fabricated, expansion-joint units into masonry.
2. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

D. Build in horizontal, pressure-relieving joints where required and indicated; construct joints by either leaving an air space or inserting a compressible filler of width required."

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

### 3.12 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

1. Where 8 inches of bearing is not available at jambs, provide additional jamb reinforcement to obtain adequate structural bearing capacity.

D. Where Specified or Indicated on Drawings: Provide concealed steel lintel system, refer to Division Section 04 "Masonry Concealed Steel Lintel System," for steel reinforcements installed inside brick cores and brick joints.

### 3.13 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall.

B. Provide and install flashing and weep holes at locations in the first course of masonry above finished ground level above the foundation wall or slab; at the heads of windows, doors, and other wall openings; at window sills and at other points of support including structural floors, shelf angles, and lintels where anchored veneers are designed or installed.

### 3.14 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.



1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Temporary Wind Bracing

1. Provide temporary masonry wall bracing to MIOSHA Construction Safety Standards, Part 2: Masonry Wall Bracing.
2. The limited access zone shall be equal to the height of the wall to be constructed plus four feet, and shall run the entire length of the wall.
3. Provide temporary wind bracing at masonry foundation walls and at other interior and exterior masonry free-standing walls exceeding 8'-0" in height according to MOSHA maximum unsupported wall heights.
4. Bracing may be of metal or wood material capable of resisting uniform lateral wind pressures of 70 miles per hour.
5. The Contractor shall be responsible to engineer and construct temporary wind bracing system as part of the base contract.

C. Placing Reinforcement: Comply with requirements in the **MSJC Code**.

D. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. General: Grout the cores of all masonry at all locations of reinforcement, bond beams, bearing plates, anchors and embedded items.
2. Comply with requirements in the **MSJC Code** for cleanouts and for grout placement, including minimum grout space and maximum pour height.
3. Limit height of vertical grout pours to not more than 48 inches.

3.15 FIELD QUALITY CONTROL

A. Inspectors: Construction Manager/Owner will engage a qualified, independent agency to perform field inspections and prepare inspection reports.

B. Testing: Construction Manager/Owner will engage a qualified, independent agency to perform field tests indicated below and prepare test reports.

C. Quality Assurance Level and Frequency:

1. **[Testing Frequency for Non-Essential Facilities - Level B Quality Assurance:**

- a. **Assurance level to be in accordance with Table 4 of the MSJC Specification for Masonry Structures.**
- b. **Frequency level for Category I, II or III buildings to be in accordance with Table 1704.5.1 Level 1 Special Inspections of the Michigan Building Code.]**

2. **[Testing Frequency for Essential Facilities - Level C Quality Assurance:**

- a. **Assurance level to be in accordance with Table 5 of the MSJC Specification for Masonry Structures.**
  - b. **Frequency level for Category IV buildings to be in accordance with Table 1704.5.3 Level 2 Special Inspections of the Michigan Building Code.]**
  - c. Note: The **MSJC and Michigan Building Codes** require inspectors to observe all grouting operations continuously. Communication with inspector is the contractor's responsibility. Grouting shall not proceed until the inspector is onsite and has made the required pre-grouting observations.
  - d. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
  - e. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, locations and position of reinforcement.
- D. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.
- E. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.
- F. Mortar Test (Property Specification): For each mix provided, per ASTM C 780.
- G. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.
- H. Testing agency will report results of tests and inspections promptly, in detail and in writing to Contractor, Architect and authorities having jurisdiction.
- I. Remove and replace work that does not comply with specified requirements.
- J. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

### 3.16 PARGING

- A. Parge pre-dampened masonry walls, where indicated, with Type S or Type N mortar applied in 2 uniform coats to a total thickness of 3/4 inch. Scarify first parge coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
  - 1. Install Dampproofing or Waterproofing on cured parging.
  - 2. Install Dampproofing or Waterproofing on interior face of cavity walls in compliance with Division Section 07 "Bituminous Dampproofing."

### 3.17 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units.

- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with nonmetallic scrape hoes or chisels.
  - 2. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
  - 3. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

### 3.18 FIELD APPLIED WATER REPELLENTS ON EXTERIOR MASONRY SURFACES

- A. Provide penetrating water repellent coating at the following locations:
  - 1. Install at exposed exterior masonry surfaces where single-wythe "integral water repellent concrete masonry units" are not indicated.
  - 2. Install at all exposed CMU exterior masonry surfaces and other areas where indicated.
- B. Provide clear penetrating water repellents on masonry surfaces in compliance with manufacturer's written instructions. Water repellents shall be Silanes or Siloxanes products with at least 20 % solids that can be applied to slightly damp surfaces.
  - 1. Provide coating according to the manufacturer's recommendations and in quantity sufficient to provide maximum water repelling qualities.
  - 2. Application shall be made in weather conditions no less favorable than that specified by the manufacturer.
  - 3. Provide a water repellent product with at least a ten (10) year warranty.

### 3.19 MASONRY WASTE DISPOSAL

- A. Waste Disposal: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove and dispose of legally from Project site.

END OF SECTION 04 20 00

## SECTION 05 1200 - STRUCTURAL STEEL FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes structural steel and architecturally exposed structural steel.
  - 1. Structural Steel.
  - 2. Architecturally exposed Structural steel.
  - 3. Grout.
  - 4. Welding.
  - 5. Galvanizing.
  - 6. Prime Painting.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 01 4000 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
  - 2. Division 09 9100 Section "Painting for high-performance coatings" surface preparation, priming and finished requirements.

#### 1.3 DEFINITIONS

- A. Structural Steel: Items as listed in 2.1 of AISC "Code of Standard Practice for Steel Buildings and Bridges", that support design loads, excluding steel, iron, or other metal items not listed, even if attached to the structural framing.
- B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

#### 1.4 SYSTEM DESCRIPTION

- A. General: Unless otherwise specifically approved in writing, furnish exact sections, weights, and kinds of material specified, using details and dimensions shown.
  - 1. Not all connections are detailed; similar details apply to similar conditions, unless otherwise indicated. Contact the Architect promptly to verify design of members or connections in any situation where design requirements are unclear.
  - 2. Substitution of other shapes of equivalent or greater strength and no greater dimension may be allowed by the Architect, but only under normal substitution procedures.

## 1.5 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineering of structural steel connections required by the Contract Documents to be performed by the fabricator to withstand design loadings or associated member capacities as indicated.
- B. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.
  - 1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design, Part 4"
  - 2. Engineering Responsibility: Fabricator's responsibility include using a qualified professional engineer to prepare structural analysis data for structural steel connections.
- C. Construction: Type 2, simple framing, typically and FR, fully restrained where moment connections are indicated.

## 1.6 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Divisions 01 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing 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.
  - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
  - 5. Indicate which items are to be galvanized or shop painted distinguishing and those which are not.
  - 6. For structural steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional structural engineer responsible for their preparation registered in the state in which the project is located.
  - 7. The fabricator is specifically responsible for the adequacy of any connections designed by the fabricator to performance standards established in the contract documents. Review by the Architect/Engineer of shop drawings shall not relieve the fabricator of this responsibility, despite wording to the contrary in paragraph 4.2.1 of the AISC Code.
- D. Welding certificates.
- E. Qualification data for firms and persons: for Installer, Fabricator, Professional engineer and Testing agency.
- F. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.
  - 1. Structural steel, including chemical and physical properties.
  - 2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.

3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified experienced Installer who meets the requirements of the ASCI Quality Certification Program.
- B. Fabricator Qualifications: A qualified fabricator who meets the requirements of the AISC Quality Certification Program as well as sufficient capacity to fabricate structural steel in the time frame required by the Project
- C. Welding: qualify procedures and personnel according to AWS D1.1, Structural Welding Code Steel.
- D. Comply with applicable provisions of the following specifications and documents:
  1. AISC's "Specification for Structural Steel Buildings and Bridges.
  2. AISC's "Seismic Provisions for Structural Steel Buildings." And Supplement No. 2.
  3. AISC's "Specification for Structural Steel Buildings --- Allowable Stress Design and Plastic Design.
  4. AISC's "Specification for the Design of Hollow Structural Sections.
  5. AISC's "Specification for Allowable Stress Design of Single-Angle Members.
  6. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.
- F. The Structural Steel shall be designed, fabricated and erected in accordance with the AISC "Manual of Steel Construction" latest edition for the "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings".
- G. AISC headings 7.9.1, 7.9.2, 7.9.3, 7.9.4 and 7.9.5 shall be deleted in its entirety and the following substituted.
  1. General: Temporary supports, such as temporary guys, braces, falsework, cribbing or other elements required for the erection operation will be determined and furnished and installed by the erector. These temporary supports will secure the steel framing, or any partly assembled steel framing, against loads comparable in intensity to those for which the structure was designed, resulting from wind, seismic forces and erection operations and against loads of interacting structural elements not classified as structural steel, but not such unpredictable loads as those due to tornado, explosion or collision.
  2. 7.9.2 Self-Supporting Steel Frames: A self-supporting steel frame is one that provides the required stability and resistance to gravity loads and design wind and seismic forces

without interaction with other elements of the structure. The erector furnishes and installs those temporary supports that are necessary to secure any element or elements of the steel framing until they are made stable without external support.

3. 7.9.3 Non-Self Supporting Steel Frames: A non-self supporting steel frame is one that requires interaction with other elements not classified as structural steel to provide the required stability or resistance to seismic forces and wind forces. It shall be the sole responsibility of the contractor to determine any and all interaction between structural steel and non-structural elements, and to coordinate as required with any and all trades to determine the schedule and sequence of placement of such elements and to determine the need for, and to furnish and install temporary supports, bracing, shoring, etc. as required for the stability of the frame and interacting structure.
  4. 7.9.4 Special Erection Conditions: When the design concept of a structure is dependent upon the use of shores, jacks or loads which must be adjusted as erection progresses to maintain camber or prestress, it shall be the responsibility of the contractor to determine such special erection conditions and to coordinate as required with any and all trades to determine the sequence of erection and to determine the need for, and to furnish any and all temporary supports, bracing, shoring, etc. as are required for the stability of the structure.
  5. 7.9.5 Removal of Temporary Supports: The temporary guys, braces, falsework, cribbing and other elements required for the erection operation, which are furnished and installed by the erector, are not the property of the Owner. In self-supporting structures, temporary supports are not required after the structural steel for a self-supporting element is located and finally fastened within the required tolerances. After such final fastening, the erector is no longer responsible for temporary support of the self-supporting element and may remove the temporary supports. In non-self supporting structures, the erector may remove temporary supports when the necessary non-structural steel elements are complete. Temporary supports are not to be removed without the consent of the erector. At completion of steel erection, any temporary supports which remain necessary to assure stability of the structure shall be left in place. The contractor shall coordinate with any and all trades to determine the time at which said temporary supports may be safely removed, and shall complete removal at that time.
- H. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel."
1. Submit evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01 3100 Section "Project Management and Coordination" for Project meetings.
- J. Testing and Inspection Agency: The Owner will engage an independent testing and inspection agency to perform testing, inspect and evaluate connections, and prepare test reports.
1. Only American Welding Society (AWS) Certified Welding Inspectors shall inspect and evaluate welds.
  2. Correct deficiencies in the structural steel work identified by the testing and inspection agency at no additional expense to the Owner. Subsequent tests to confirm the adequacy of the corrected work will be at the contractor's expense.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation and economical flow of work. Deliver steel members properly marked for field assembly and erection.
- B. Identification: Specifically mark high-strength steel in accordance with requirements of ASTM A 6 and maintain markings until steel has placed in final position.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
  - 1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
  - 2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

## 1.9 COORDINATION

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.
- B. Atrium framing requires shoring and temporary bracing. Contractor to submit calculations and drawings of the proposed shoring including description of sequencing prepared under the seal of a qualified professional engineer.

## PART 2 - PRODUCTS

### 2.1 STRUCTURAL STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A99M or ASTM A 572/A572M, Grade.
- B. Channels, Angles, M or S – Shapes: ASTM A 36/A36/A 36M or ASTM A 572/AA572M, Grade 50.
- C. Plate and Bar: ASTM A 36/ASTM A572/A572M, Grade.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53, Type E or S, Grade B.
  - 1. Weight Class: Extra Strong unless otherwise indicated.
  - 2. Finish: Black, except where indicated to be galvanized.
- F. Welding Electrodes: Comply with AWS requirements.



## 2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
  - 1. Finish: Plain.
  - 2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.
    - a. Finish: Plain.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy hex steel structural bolts Or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563 heavy hex Carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.
  - 1. Direct-Tensioned Indicators: ASTM F 959, Type 490, compressible-washer type, plain.
- C. Shear Connectors: ASTM A 108, Grade 1015 though 1020, headed-stud type, cold-finished Carbon-steel; AWS D1.1, Type B.
- D. Unheaded Anchor Rods: ASTM A 36/A #^ M.
  - 1. Configuration: Hooked.
  - 2. Nuts: ASTM A 563 hex carbon steel.
  - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
  - 4. Washers: ASTM F 436 hardened carbon steel.
  - 5. Finish: Plain.
- E. Headed Anchor Rods: Straight.
  - 1. Nuts: ASTM A 563 heavy carbon steel.
  - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
  - 3. Washers: ASTM F 436 hardened carbon steel.
  - 4. Finish: Plain or Hot-dip zinc coating, ASTM A 153M, Class C.
- F. Threaded Rods: ASTM A 36/A 36M.
  - 1. Nuts: ASTM A 563 hex carbon steel.
  - 2. Washers: ASTM A 563 hex carbon steel.
  - 3. Finish: Plain.
- G. Clevises and Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.
- H. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- I. Sleeve Nuts: ASTN A 108, Grade 1018, cold-finished carbon steel.

## 2.2 PRIMER

- A. Primer: SSPC-Paint 25; Type II, iron oxide, zinc oxide, raw linseed oil and alkyd primer.
- B. Primer: SSPC-Paint 23, latex primer.

- C. Galvanizing Repair Paint: MP1 # 18, MP1 # 19, or SSPC-Paint 20, ASTM A 780.
  
- D. Shop Primed Steel – Pool Area Exposure:
  - 1. Shop Primer to be applied by fabricator.
  - 2. Spot Primed: Tnemec Series 90-97 Tneme-Zinc Aromatic Urethane at 2.5 to 3.5 mil DFT.
  - 3. Intermediate Coat: Tnemec Series 161 Tnemec-Fascure Polyamide Epoxy corrosion resistant coating for protection against abrasion and mild chemical contact at 5.0 to 6.0 mil DFT.
  - 4. Finish Coat: Tnemec Series 75 Endura-Shield Aliphatic Acrylic Polyurethane highly resistant coating for abrasion, wet conditions corrosive fumes, chemical contact and excellent weathering properties at 2.5 to 3.0 mil DFT.
  - 5. Refer to Division 09 Section “Painting”.
  
- E. Galvanized Steel and Decking – Pool Area Exposure:
  - 1. Surface Preparation: as recommended by coating manufacturer.
  - 2. Base Coat: Tnemec Series 161 Tnemec-Fascure Polyamide Epoxy corrosion resistant coating for protection against abrasion and mild chemical contact at 5.0 to 6.0 mil DFT.
  - 3. Finish Coat: Tnemec Series 75 Endura-Shield Aliphatic Polyurethane highly resistant coating for abrasion, wet conditions corrosive fumes, chemical contact and excellent weathering properties at 2.5 to 3.0 mil DFT>
  - 4. Refer to Division 09 Section: “Painting”.

## 2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, nonstaining, mixed with water to consistency suitable for application, and a 30-minute working time.

## 2.4 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC “ Code of Standard Practice for Steel Buildings and Bridges” and AISC’s “Specifications for Structural Steel Buildings and Plastic Design”.
  - 1. Camber structural steel members where indicated.
  - 2. Identify high-strength structural steel according to **ASTM A 6** and maintain markings until steel has been erected.
  - 3. Mark and match-mark materials for field assembly.
  - 4. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
  
- B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC’s “Code of Standard Practice for Steel Buildings and Bridges” for structural steel identified as architecturally exposed structural steel.
  - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, roughness and other miscellaneous marks.

2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating and shop priming.
- C. 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.
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning".
- G. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in completed wall framing.
- H. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches on-center, unless otherwise indicated.
- D. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members and coordinate to Shop Drawings.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  2. Base-Plate Holes: cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  3. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

## 2.5 SHOP CONNECTIONS

- A. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections on the Drawings.
- B. Weld Connections: Comply with AWS D1.1 for welding procedures specifications, tolerances, appearance and quality of welds, and methods used in correcting welding work.
1. Remove backing bars or runoff tabs, back gouge, and grind smooth.
  2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill finish.
  3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show through on exposed steel surfaces.

- a. Grind butt welds flush.
- b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

## 2.6 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
  1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of **2 inches**.
  2. Surfaces to be field welded.
  3. Surfaces to be high-strength bolted with slip-critical connections.
  4. Surfaces to receive sprayed fire-resistive materials.
  5. Galvanized surfaces shall be prime painted after galvanizing.
  6. Coordinate primer with Division 9 for items to receive Tnemec coating.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
  1. SSPC-SP 2 "Hand Tool Cleaning."
    - a. Typical except for architecturally exposed steel.
  2. SSPC-SP 67/NACE No. 3, "Commercial Blast Cleaning."
    - a. Required for architecturally exposed steel.
- C. Surface Preparation: Pool Area Exposure –SSPC-SP6 Commercial Blast Cleaning removing mill scale, rust, paint, and other foreign matter by use of abrasives. All surfaces must be clean, Dry and free of oil, grease and other contaminates.
- D. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than **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 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

## 2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123/A 123M.
  1. Fill vent holes and grind smooth after galvanizing.
  2. Galvanize lintels, and exposed plates, angles, tubes, shelf angles and rolled shapes attached to structural steel frame and/or located in exterior walls

## 2.8 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.
  - 1. Provide testing agency with access to places where structural steel Work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
- D. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the following inspection procedures, at agency's option:
  - 1. Visually inspect all welds.
  - 2. Inspect 100 percent of full penetration welds, using one of the following test methods:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
    - d. Ultrasonic Inspection: ASTM E 164.
  - 3. Inspect 25 percent of fillet welds, using one of the following test methods:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709, performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Radiographic Inspection: ASTM E 94.
    - d. Ultrasonic Inspection: ASTM E 164.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify elevations of concrete and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with erection only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design".
- B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base plates.
  - 1. Set base plates for structural members on wedges, shims, leveling plates, or setting nuts as required.
  - 2. Weld plate washers to top of base plate.
  - 3. Pretension 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 base or bearing plate prior to packing with grout.
  - 4. Pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection, unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.
- H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

### 3.4 FIELD CONNECTION

- A. High-Strength Bolts: Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance and quality of welds, and methods used in correcting welding work.
1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and specifications for Structural Steel Buildings – Allowable Stress Design and Plastic Design for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
  2. Remove backing bars or runoff tads, back gouge, and grind smooth.
  3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's " Code of Standard Practice for Steel Buildings and Bridges" for mill material.
  4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
    - a. Grind butt welds flush.
    - b. Grind and fill exposed fillet welds to smooth profile. Dress exposed welds.

### 3.5 FIELD QUALITY CONTROL

- A. Owner may engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections and prepare test reports.
- B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's " Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be inspected and tested according to AWS D1.1 and additional visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at the testing agency's option:
1. Visually inspect all field welds.
  2. Inspect 100 percent of full penetration welds, using one of the following test methods:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Radiographic Inspection: ASTM E 94/ASTM E 142; minimum quality level "2-2T".
    - d. Ultrasonic Inspection: ASTM E 164.
  3. Inspect 25 percent of fillet welds, using one of the following test methods:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Radiographic Inspection: ASTM E 94.
    - d. Ultrasonic Inspection: ASTM E 164.
- D. In addition to visual inspection, field-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.

2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.
- E. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- F. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
  1. Clean and prepare surfaces by SSPC-SP 2 hand-tool or SSPC-SP 3 power-tool cleaning.
  2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- B. Touchup Painting: Cleaning and touchup painting are specified in Division 09 "Painting".

END OF SECTION 05 1200



## SECTION 05 4000 - COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Exterior load-bearing wall framing.
  - 2. Interior load-bearing wall framing.
  - 3. Exterior non-load-bearing wall framing.
  - 4. Floor joist framing.
  - 5. Roof trusses.
  - 6. Roof rafter framing.
  - 7. Ceiling joist framing.
- B. Related Sections include the following:
  - 1. Division 05 5000 Section "Metal Fabrications" for masonry shelf angles and connections and Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As follows, unless otherwise indicated on Drawings.
    - a. Dead Loads: 20 psf.
    - b. Live Loads: 100 psf.
    - c. Roof Loads: 50 psf.
    - d. Snow Loads: 30 psf.
    - e. Wind Loads: 30 psf.
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/720 of the wall height.
    - b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft. (239 Pa).
    - c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/720 of the wall height.

- d. Floor Joist Framing: Vertical deflection of 1/480 for live loads and 1/360 for total loads of the span.
  - e. Roof Trusses: Vertical deflection of 1/360 of the span.
  - f. Scissor Roof Trusses: Horizontal deflection of 1-1/4 inches (32 mm) at reactions.
  - g. Roof Rafter Framing: Horizontal deflection of 1/360 of the horizontally projected span.
  - h. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.
3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
  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 3/4 inch (19 mm).
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
  2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
  3. Roof Trusses: Design according to AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

#### 1.4 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
  1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding Certificates. Copy of certificates for welding procedures and personnel.
- D. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
  1. Steel sheet.
  2. Expansion anchors.
  3. Power-actuated anchors.
  4. Mechanical fasteners.
  5. Vertical deflection clips.
  6. Horizontal drift deflection clips

7. Miscellaneous structural clips and accessories.

E. Research/Evaluation Reports: For cold-formed metal framing.

#### 1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

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

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

H. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 3100 Section "Project Management and Coordination."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
1. AllSteel Products, Inc.
  2. Clark Steel Framing.
  3. Custom Stud, Inc.
  4. Dale/Incor.
  5. Dietrich Metal Framing; a Worthington Industries Company.
  6. Formetal Co. Inc. (The).
  7. MarinoWare; a division of Ware Industries.
  8. SCAFCO Corporation.
  9. Southeastern Stud & Components, Inc.
  10. Steel Construction Systems.
  11. Super Stud Building Products, Inc.

### 2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: **ST33H** (**ST230H**).
  2. Coating: **G90** (**Z275**) or equivalent.
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
  2. Coating: **G90** (**Z275**).

### 2.3 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: **0.0538 inch** (**1.37 mm**).
  2. Flange Width: **1-5/8 inches** (**41 mm**).
  3. Section Properties: Provide minimum allowable calculated section modulus, moment of inertia, and allowable moment.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm) and Matching steel studs.
  2. Flange Width: **1-1/4 inches** (**32 mm**).
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch (1.72 mm).
2. Flange Width: 2-1/2 inches (63 mm).
3. Section Properties: Provide minimum allowable calculated section modulus, moment of inertia, and allowable moment.

D. Steel Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch (1.72 mm).
2. Top Flange Width: 2-1/2 inches (63 mm).
3. Section Properties: Provide minimum allowable calculated section modulus, moment of inertia, and allowable moment.

## 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: 0.0966 inch (2.45 mm).
2. Flange Width: 2-1/2 inches (63 mm).
3. Section Properties: Provide minimum allowable calculated section modulus, moment of inertia, and allowable moment.

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: 0.0966 inch (2.45 mm) and Matching steel studs.
2. Flange Width: 1-1/4 inches (32 mm).

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Dietrich Metal Framing; a Worthington Industries Company.
  - b. MarinoWare, a division of Ware Industries.
  - c. SCAFCO Corporation
  - d. The Steel Network, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch (1.72 mm).
2. Flange Width: 3 inches (75 mm) plus twice the design gap for other applications.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
    - a. Minimum Base-Metal Thickness: **0.0677 inch (1.72 mm)**.
    - b. Flange Width: 3 inches (**75 mm**) plus twice the design gap for other applications.
  2. Inner Track: Of web depth indicated, and as follows:
    - a. Minimum Base-Metal Thickness: **0.0677 inch (1.72 mm)**.
    - b. Flange Width: 3 inches minimum.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

## 2.5 FLOOR JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, punched, with enlarged service holes, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: **0.0966 inch (2.45 mm)**.
  2. Flange Width: **2-1/2 inches (63 mm)**, minimum.
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel joists.
  2. Flange Width: **2-1/2 inches (63 mm)**, minimum.

## 2.6 ROOF TRUSSES

- A. Roof Truss Members: Manufacturer's standard- C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges.
1. Minimum Base-Metal Thickness: **0.0677 inch (1.72 mm)**.
  2. Flange Width: **2 inches (51 mm)**, minimum.

## 2.7 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: **0.0966 inch (2.45 mm)**.
  2. Flange Width: **2 inches (51 mm)**, minimum.
- B. Built-up Members: Built-up members of manufacturer's standard C-shaped steel section, with stiffened flanges, nested into a U-shaped steel section joist track, with unstiffened flanges; unpunched; of web depths indicated; and as follows:
1. Minimum Base-Metal Thickness: Matching steel rafters.
  2. Flange Width: **2 inches (51 mm)**, minimum.

## 2.8 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with enlarged service holes, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
  2. Flange Width: 1-5/8 inches (41 mm), minimum.

## 2.9 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
  2. Bracing, bridging, and solid blocking.
  3. Web stiffeners.
  4. Anchor clips.
  5. End clips.
  6. Foundation clips.
  7. Gusset plates.
  8. Stud kickers, knee braces, and girts.
  9. Joist hangers and end closures.
  10. Hole reinforcing plates.
  11. Backer plates.

## 2.10 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.11 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. 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: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## 2.12 FABRICATION

- A. Fabricate cold-formed metal 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 metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
  - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

### 3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding **1/16 inch (1.6 mm)**.
- D. Install cold-formed metal 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 metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

- b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of **1/8 inch in 10 feet (1:960)** and as follows:
  - 1. Space individual framing members no more than plus or minus **1/8 inch (3 mm)** from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
  - 1. Anchor Spacing: To match stud spacing.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of **1/8 inch (3 mm)** between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
  - 1. Stud Spacing: **16 inches (406 mm), unless otherwise indicated.**
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
  2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced **48 inches (1220 mm)**, unless otherwise indicated. Fasten at each stud intersection.
1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to **6 inches (150 mm)** deep.
  2. 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. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
1. Stud Spacing: **16 inches (406 mm)**, unless otherwise indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.
  2. Install double deep-leg deflection tracks and anchor outer track to building structure.
  3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
  4. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than **48 inches (1220 mm)** apart. Fasten at each stud intersection.
1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within **12 inches (305 mm)** of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
    - a. Install solid blocking at **96-inch (2440-mm)** on-center.
  2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  3. 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.
  4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud grits, to provide a complete and stable wall-framing system.

### 3.6 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
  1. Install joists over supporting frame with a minimum end bearing of **1-1/2 inches (38 mm)**.
  2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than **2 inches (51 mm)** clear from abutting walls, and as follows:
  1. Joist Spacing: **16 inches (406 mm) on-center**, unless otherwise indicated.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.
  1. Install web stiffeners to transfer axial loads of walls above.

- F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:
  - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
  - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

### 3.7 TRUSS INSTALLATION

- A. Install, bridge, and brace trusses according to Shop Drawings and requirements in this Section.
- B. Truss Spacing: **16 inches (406 mm)** on-center, unless otherwise indicated.
- C. Do not alter, cut, or remove framing members or connections of trusses.
- D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacing indicated.
- E. Erect trusses without damaging framing members or connections.
- F. Align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.
- G. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to LGSEA's Technical Note 551e, "Design Guide for Permanent Bracing of Cold-Formed Steel Trusses."

### 3.8 FIELD QUALITY CONTROL

- A. Testing: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, and ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 4000

## SECTION 06 1000 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Framing with dimension lumber.
  - 2. Wood-Preservative Treated Lumber
  - 3. Fire-Retardant Treated Materials.
  - 4. Rooftop equipment bases and support curbs.
  - 5. Wood blocking, cants, and nailers.
  - 6. Wood sleepers, Wood furring and grounds.
  - 7. Utility shelving.
  - 8. Plywood backing panels.
- B. Related Sections include the following:

#### 1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of **2 inches nominal (38 mm actual)** or greater but less than **5 inches nominal (114 mm actual)** in least dimension.
- C. Timber: Lumber of **5 inches nominal (114 mm actual)** or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
  - 2. NLGA: National Lumber Grades Authority.
  - 3. RIS: Redwood Inspection Service.
  - 4. SPIB: The Southern Pine Inspection Bureau.
  - 5. WCLIB: West Coast Lumber Inspection Bureau.
  - 6. WWPA: Western Wood Products Association.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
  4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Wood-preservative-treated wood.
  2. Fire-retardant-treated wood.
  3. Engineered wood products.
  4. Power-driven fasteners.
  5. Powder-actuated fasteners.
  6. Expansion anchors.
  7. Metal framing anchors.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
1. Dimension lumber framing.
  2. Timber.
  3. Laminated veneer lumber.
  4. Parallel-strand lumber.
  5. Prefabricated wood I-joists.
  6. Rim boards.
  7. Miscellaneous lumber.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.



## PART 2 - PRODUCTS

### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWPA C31 with inorganic boron (SBX).
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat all rough carpentry, unless otherwise indicated.

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than **18 inches (460 mm)** above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

### 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
  1. Use Exterior type for exterior locations and elsewhere, where indicated.
  2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
  3. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
  1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- D. Application: Treat all rough lumber that is not exposed to view.
  1. Provide fire treated wood/lumber in all areas and locations required by Building Codes and other Agencies having jurisdiction.

### 2.4 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 15 percent for **2-inch nominal (38-mm actual)** thickness or less, 19 percent for more than **2-inch nominal (38-mm actual)** thickness at time of drying operation.
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade and any of the following species:
  1. Hem-fir (north); NLGA.
  2. Southern pine; SPIB.
  3. Spruce-pine-fir; NLGA.
  4. Hem-fir; WCLIB, or WWPA.
  5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
  6. Western woods; WCLIB or WWPA.
- C. Exterior and Load-Bearing Walls, Construction or No. 2 grade and any of the following species:

1. Hem-fir (north); NLGA.
  2. Southern pine; SPIB.
  3. Douglas fir-larch; WCLIB or WWPA.
  4. Spruce-pine-fir; NLGA.
  5. Douglas fir-south; WWPA.
  6. Hem-fir; WCLIB or WWPA.
  7. Douglas fir-larch (north); NLGA.
  8. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- D. Exterior and Load-Bearing Walls and Non-Load-Bearing Interior Partitions: Any species of machine stress-rated dimension lumber with a grade of not less than 2400f-2.0E.
- E. Exterior and Load-Bearing Walls and Non-Load-Bearing Interior Partitions: Any species and grade with a modulus of elasticity of at least **1,500,000 psi (10 350 MPa)** and an extreme fiber stress in bending of at least **[1000 psi (6.9 MPa)] [850 psi (5.86 MPa)]** for **2-inch nominal (38-mm actual)** thickness and **12-inch nominal (286-mm actual)** width for single-member use.
- F. Ceiling Joists (Non-Load-Bearing): Construction or No. 2 grade and any of the following species:
1. Hem-fir (north); NLGA.
  2. Southern pine; SPIB.
  3. Douglas fir-larch; WCLIB or WWPA.
  4. Douglas fir-larch (north); NLGA.
  5. Spruce-pine-fir; NLGA.
  6. Hem-fir; WCLIB or WWPA.
  7. Douglas fir-south; WWPA.
  8. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- G. Joists, Rafters, and Other Framing Not Listed Above: Construction or No. 2 grade and any of the following species:
1. Hem-fir (north); NLGA.
  2. Southern pine; SPIB.
  3. Douglas fir-larch; WCLIB or WWPA.
  4. Spruce-pine-fir; NLGA.
  5. Douglas fir-south; WWPA.
  6. Hem-fir; WCLIB or WWPA.
  7. Douglas fir-larch (north); NLGA.
  8. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- H. Joists, Rafters, and Other Framing Not Listed Above: Any species of machine stress-rated dimension lumber with a grade of not less than 2400f-2.0E.
- I. Joists, Rafters, and Other Framing Not Listed Above: Any species and grade with a modulus of elasticity of at least **1,500,000 psi (10 350 MPa)** and an extreme fiber stress in bending of at least **1000 psi (6.9 MPa)** for **2-inch nominal (38-mm actual)** thickness and **12-inch nominal (286-mm actual)** width for single-member use.
- J. Exposed Exterior and Interior Framing Indicated to Receive a Stained or Natural Finish: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Wood Species and Grade: As indicated on Drawings.

## 2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
  4. Cants.
  5. Furring.
  6. Grounds.
  7. Utility shelving.
- B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with fifteen (15) percent maximum moisture content of any species.
- C. For items of dimension lumber size, provide Construction or No. 2 grade lumber with nineteen (19) percent maximum moisture content:
- D. For exposed boards, provide lumber with nineteen (19) percent maximum moisture content Construction Grade No. 2:
- E. For concealed boards, provide lumber with fifteen (15) percent maximum moisture content Construction grade stud or No. 3:
- F. 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.
- G. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- H. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.6 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than **1/2-inch (13-mm)** nominal thickness.
  1. Provide at least 2 – 48" x 96" x 5/8" plywood panels and more as required by wall equipment.

## 2.9 SHEATHING

- A. Plywood Roof and Wall Sheathing: Refer to Division 06 Section "Sheathing".
- B. Sub-flooring and Underlayment: Refer to Division 06 Section "Sheathing".

## 2.10 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: **ASME B18.2.1 (ASME B18.2.3.8M)**.
- F. Bolts: Steel bolts complying with **ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6)**; with **ASTM A 563 (ASTM A 563M)** hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Stainless steel with bolts and nuts complying with **ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4)**.

## 2.11 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alpine Engineered Products, Inc.
  - 2. Cleveland Steel Specialty Co.
  - 3. Harlen Metal Products, Inc.
  - 4. KC Metals Products, Inc.
  - 5. Simpson Strong-Tie Co., Inc.
  - 6. Southeastern Metals Manufacturing Co., Inc.
  - 7. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, **G60 (Z180)** coating designation.
  - 1. Use for interior locations where stainless steel is not indicated.

- D. Stainless-Steel Sheet: ASTM A 666, Type 304 or 316.
1. Use Type 304 for exterior locations and where indicated.
  2. Use Type 316 at humid and toxic chemical locations and vicinity.
- E. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.
1. Thickness: 0.062 inch (1.6 mm) minimum.
- F. I-Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.
1. Thickness: 0.062 inch (1.6 mm) minimum.
- G. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
1. Strap Width: 2 inches (50 mm).
  2. Thickness: 0.062 inch (1.6 mm).
- H. Bridging: Rigid, V-section, nailless type, 0.050 inch (1.3 mm) thick, length to suit joist size and spacing.
- I. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch (25 mm) above base and with 2-inch- (50-mm-) minimum side cover, socket 0.062 inch (1.6 mm) thick, and standoff and adjustment plates 0.108 inch (2.8 mm) thick.
- J. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
1. Width: 1-1/4 inches (32 mm), unless otherwise indicated.
  2. Thickness: 0.062 inch (1.6 mm), unless otherwise indicated.
  3. Length: [16 inches (400 mm)] [24 inches (600 mm)] [As indicated].
- K. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches (38 mm) wide by 0.050 inch (1.3 mm) thick. Tie fastens to side of rafter or truss, face of top plates, and side of stud below.
- L. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.
- M. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick by 36 inches (914 mm) long.
- N. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
1. Bolt Diameter: 5/8 inch (15.8 mm) minimum.

- O. Wall Bracing: T-shaped bracing made for letting into studs in saw kerf, 1-1/8 inches (29 mm) wide by 9/16 inch (14 mm) deep by 0.034 inch (0.85 mm) thick with hemmed edges.
- P. Wall Bracing: Angle bracing made for letting into studs in saw kerf, 15/16 by 15/16 by 0.040 inch (24 by 24 by 1 mm) thick with hemmed edges.

## 2.12 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
  - 1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.
- E. Vapor Retarders and Air Barriers: Refer to Division 07 Section "Thermal Insulation."

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than **16 inches (406 mm)** o.c.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than **96 inches (2438 mm)** o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
  2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than **96 inches (2438 mm)** o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and **2-inch nominal- (38-mm actual-)** thickness.
  3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than **100 sq. ft. (9.3 sq. m)** and to solidly fill space below partitions.
  4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than **20 feet (6 m)** o.c.
- H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
  2. Use copper naphthenate for items not continuously protected from liquid water.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
  2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
  3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
  4. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
  5. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.
- K. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Comply with approved fastener patterns where applicable.



2. Use finishing nails, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

### 3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than **1-1/2 inches (38 mm)** wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

### 3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
  1. Install Fire-blocking at furred spaces of walls at each floor level at the ceiling with wood blocking tightly fitted to close-up voids.
- B. Furring to Receive Plywood or Hardboard Paneling: Install **1-by-3-inch nominal- (19-by-63-mm actual-)** size furring horizontally and vertically at 24 inches (610 mm) on-center and as indicated on Drawings.
- C. Furring to Receive Gypsum Board or Plaster Lath: Install **1-by-2-inch nominal- (19-by-38-mm actual-)** size furring vertically at 16 inches (406 mm) on-center and as indicated on Drawings.

### 3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of **2-inch nominal (38-mm actual)** thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction, unless otherwise indicated.
  1. For exterior walls, provide **2-by-6-inch nominal- (38-by-140-mm actual-)** size wood studs spaced **16 inches (406 mm)** o.c., unless otherwise indicated.
  2. For interior partitions and walls, provide **2-by-4-inch nominal- (38-by-89-mm actual-)** size wood studs spaced **16 inches (406 mm)** o.c., unless otherwise indicated.
  3. Provide continuous horizontal blocking at midheight of partitions more than **96 inches (2438 mm)** high, using members of **2-inch nominal (38-mm actual)** thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than **4-inch nominal (89-mm actual)** depth for openings **48 inches (1200 mm)** and less in width, **6-inch nominal (140-mm actual)** depth for openings **48 to 72 inches (1200 to 1800 mm)** in width, **8-inch nominal (184-mm actual)** depth for openings **72 to 120 inches (1800 to 3000 mm)** in width, and not less than **10-inch nominal (235-mm actual)** depth for openings **10 to 12 feet (3 to 3.6 m)** in width.
  2. For load-bearing walls, provide double-jamb studs for openings **60 inches (1500 mm)** and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated or, if not indicated, according to Table R502.5(1) or Table R502.5(2), as applicable, in ICC's International Residential Code for One- and Two-Family Dwellings.
- D. Provide diagonal bracing in exterior walls, at both walls of each external corner, at 45-degree angle, full-story height, unless otherwise indicated. Use **1-by-4-inch nominal- (19-by-89-mm actual-)** size boards, let-in flush with faces of studs, metal wall bracing, let into studs in saw kerf.

### 3.5 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than **1-1/2 inches (38 mm)** of bearing on wood or metal, or **3 inches (76 mm)** on masonry. Attach floor joists as follows:
1. Where supported on wood members, by toe nailing or by using metal framing anchors.
  2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends **3 inches (76 mm)** and do not embed more than **4 inches (102 mm)**.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds **48 inches (1200 mm)**.
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than **2 inches (50 mm)** from top or bottom.
- E. Provide solid blocking of **2-inch nominal (38-mm actual)** thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than **4 inches (102 mm)** or securely tie opposing members together. Provide solid blocking of **2-inch nominal (38-mm actual)** thickness by depth of joist over supports.
- G. Anchor members paralleling masonry with **1/4-by-1-1/4-inch (6.4-by-32-mm)** metal strap anchors spaced not more than **96 inches (2438 mm)** o.c., extending over and fastening to 3 joists. Embed anchors at least **4 inches (102 mm)** into grouted masonry with ends bent at right angles and extending **4 inches (102 mm)** beyond bend.
- H. Provide additional solid blocking between joists under jamb studs for openings.
- I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- J. Provide bridging of type indicated below, at intervals of **96 inches (2438 mm)** o.c., between joists.
1. Diagonal wood bridging formed from bevel-cut, **1-by-3-inch nominal- (19-by-64-mm actual-)** size lumber, double-crossed and nailed at both ends to joists.
  2. Steel bridging installed to comply with bridging manufacturer's written instructions.

### 3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide **1-by-8-inch nominal- (19-by-184-mm actual-)** size or **2-by-4-inch nominal- (38-by-89-mm actual-)** size stringers spaced **48 inches (1200 mm)** o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and **2 inches (50 mm)** deeper. Bevel ends of jack rafters for full bearing against valley rafters.
  2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and **2 inches (50 mm)** deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide **1-by-6-inch nominal- (19-by-140-mm actual-)** size boards between every third pair of rafters, but not more than **48 inches (1219 mm)** o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.
- E. PROTECTION
- F. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- G. Protect rough carpentry from weather. Should rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 1000

SECTION 06 4023 - INTERIOR ARCHITECTURAL WOODWORK  
CUSTOM-BUILT MILLWORK AND 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. This Section includes the following:

1. Interior standing and running trim.
2. Interior frames and jambs.
3. Interior ornamental work.
4. Wood cabinets (custom-built).
5. Plastic-laminate cabinets (custom-built).
6. Wood countertops (custom-built).
7. Plastic-laminate countertops.
8. Solid-surfacing-material countertops.
9. Closet and utility shelving.
10. Shop finishing of interior woodwork.
11. Ballistic armor wall panels

- B. Related Sections include the following:

1. Division 06 1000 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
- B. Rough carriages for stairs are a part of interior architectural woodwork. Platform framing, headers, partition framing, and other rough framing associated with stair work are specified in Division 06 Section "Rough Carpentry."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories, handrail brackets and finishing materials and processes.
- B. Product Data: For solid-surfacing material;

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: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
  3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
  4. Apply AWI-certified compliance label.
- D. Samples for Verification:
1. Lumber with or for transparent finish, for each species.
  2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
  3. Veneer-faced panel products with or for transparent finish, **12 by 24 inches (300 by 600 mm)**, for each species and cut. Include at least one face-veneer seam and finish as specified.
  4. Lumber and panel products with shop-applied opaque finish, for lumber and for panels, for each finish system and color, with 1/2 of exposed surface finished.
  5. Plastic laminates, for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
  6. Thermoset decorative-panels, for each type, color, pattern, and surface finish, with edge banding on 1 edge.
  7. Solid-surfacing materials, **6 inches (150 mm)** square.
  8. Corner pieces.
  9. Exposed cabinet hardware and accessories, one unit for each type and finish.

## 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop in continuous business at least five (5) years 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. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products or certified participant in AWI's Quality Certification Program.
- C. Source Limitations: Engage a qualified woodworking firm in continuous business at least five (5) years to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers and wood doors with face veneers that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.
- D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide AWI Quality Certification Program labels and certificates indicating that  
woodwork, including installation, complies with requirements of grades specified.
  - E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated,  
provide materials and products with specified fire-test-response characteristics as determined  
by testing identical products per test method indicated by UL, ITS, or another testing and  
inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate  
markings of applicable testing and inspecting agency in the form of separable paper label or,  
where required by authorities having jurisdiction, imprint on surfaces of materials that will be  
concealed from view after installation.
  - F. Mockups: Build mockups to verify selections made under sample submittals and to  
demonstrate aesthetic effects and set quality standards for materials and execution.
    1. Approved mockups may become part of the completed Work if undisturbed at time of  
Substantial Completion.
  - G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in  
Division 01 3100 Section "Project Management and Coordination."
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Do not deliver woodwork until painting and similar operations that could damage woodwork  
have been completed in installation areas. If woodwork must be stored in other than installation  
areas, store only in areas where environmental conditions comply with requirements specified in  
"Project Conditions" Article.
- 1.7 PROJECT CONDITIONS
- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet  
work is complete, and HVAC system is operating and maintaining temperature and relative  
humidity at occupancy levels during the remainder of the construction period.
  - B. Field Measurements: Where woodwork is indicated to fit to other construction, verify  
dimensions of other construction by field measurements before fabrication, and indicate  
measurements on Shop Drawings. Coordinate fabrication schedule with construction progress  
to avoid delaying the Work.
    1. Locate concealed framing, blocking, and reinforcements that support woodwork by field  
measurements before being enclosed, and indicate measurements on Shop Drawings.
    2. Established Dimensions: Where field measurements cannot be made without delaying  
the Work, establish dimensions and proceed with fabricating woodwork without field  
measurements. Provide allowance for trimming at site, and coordinate construction to  
ensure that actual dimensions correspond to established dimensions.
    3. Forward advance information for embedded items to the project for installation.
- 1.8 COORDINATION
- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related  
units of Work specified in other Sections to ensure that interior architectural woodwork can be  
supported and installed as indicated.

- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 08 Section "Door Hardware" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

## PART 2 - PRODUCTS

### 2.1 CUSTOM MILLWORK WOODWORK FABRICATORS

- A. Fabricators: Subject to compliance with requirements, fabricators offering custom-built interior architectural woodwork and cabinets that may be incorporated into the Work are limited to:
1. Custom Millwork Fabricators and Installers in continuous business at least five (5) years. Submit the following information:
    - a. Company history; including number of permanent employees with length of service and technical history.
    - b. Submit a list of at least five (5) completed projects within the last three (3) years, including building project and cost of millwork.
    - c. Names Architect and Owner with phone information.
    - d. Submit AWI Certification.
    - e. Submit information on Architect's "Request for Substitution" form located in Specification Section 01 6000.
  2. Pre-approved Millwork Fabricators listed below are exempt from the above requirements.
    - a. Architrave woodworking, Inc., Waterford, MI.
    - b. Madeira Woodworking Company, Troy, MI
    - c. JD&M Building Co., Troy, MI.
    - d. Paramount Commercial Interiors, Royal Oak, MI.

### 2.2 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's, WIC's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: **Verify and match existing**
1. Red Oak – rift-cut.
  2. Cherry – rotary-cut.
  3. Birch – rotary-cut.
  4. Other - .
- C. Wood Species for Opaque Finish: Birch or any closed-grain hardwood.
- D. Wood Products: Comply with the following:
1. Hardboard: AHA A135.4.
  2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
  3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
  4. Softwood Plywood: DOC PS 1, Medium Density Overlay.

5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- E. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
  1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semi-exposed edges.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
  1. Manufacturers: Subject to compliance with requirements, provide high-pressure decorative laminates one of the following:
    - a. Arborite; Division of ITW Canada, Inc.
    - b. Formica Corporation.
    - c. Lamin-Art, Inc.
    - d. Nevamar Company, LLC; Decorative Products Div.
    - e. Panolam Industries International Incorporated.
    - f. Wilsonart International; Div. of Premark International, Inc.
- G. Chemical-Resistant, High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Formica Corporation; Lab Grade 840 Black.
    - b. Panolam Industries International Incorporated; Pionite Chemguard.
    - c. Wilsonart International, Div. of Premark International, Inc.; Chemsurf.
- H. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Avonite, Inc.
    - b. E. I. du Pont de Nemours and Company, Corian.
    - c. Formica Corporation.
    - d. Nevamar Company, LLC; Decorative Products Div.
    - e. Swan Corporation (The).
    - f. Wilsonart International; Div. of Premark International, Inc.
- I. Stone Manufacturers:
  1. Cold Spring Granite Co.
  2. Georgia Marble Co.
  3. Idaho Travertine Corp.
  4. Mankota Kasota Stone, Inc.
  5. Vermont Quarries Corp.
  6. Stone Contractors:
    - a. Booms Stone Co., Redford, MI
    - b. Wolverine Stone Co., Warren, MI.



- c. AEGM, Inc., dba: Artistic European Granite & Marble, Inkster, MI.
- J. Tempered Float Glass for Cabinet doors, Shelves and Counter tops: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3; with exposed edges smoothed and seamed before tempering, minimum of ¼ inch thick.
  - 1. Provide glass thickness required for all items. Verify for structural adequacy.

## 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.
  - 1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
  - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
  - 3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:
  - 1. Exterior Type: Organic-resin-based formulation thermally set in wood by kiln drying.
  - 2. Interior Type A: Low-hygroscopic formulation.
  - 3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking plant certified by testing and inspecting agency.
  - 4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
  - 5. Kiln-dry materials before and after treatment to levels required for untreated materials.
- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
  - 1. Product: Subject to compliance with requirements, provide "Duraflake FR" by Weyerhaeuser.
- D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
  - 1. Product: Subject to compliance with requirements, provide "Meditate FR" by SierraPine Ltd.; Medite Div.

## 2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Butt Hinges: 2-3/4-inch (70-mm), 5-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening.
- D. Back-Mounted Pulls: BHMA A156.9, B02011.
- E. Wire Pulls: Back mounted, solid satin chrome finish, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter, unless otherwise indicated.
- F. Catches: Satin chrome finish, roller catches, BHMA A156.9, B03071.
- G. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.
- H. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- I. Drawer Slides: BHMA A156.9, B05091; side mounted and extending under bottom edge of drawer; full-extension type; epoxy-coated-steel with steel ball-bearings; of the following grades:
  - 1. Box Drawer Slides: Grade 1HD-100.
  - 2. File Drawer Slides Grade 1HD-200.
  - 3. Pencil Drawer Slides: Grade 1.
  - 4. Keyboard Slides: Grade 1HD-100.
- J. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.
- K. Door Locks: BHMA A156.11, E07121, where indicated.
- L. Drawer Locks: BHMA A156.11, E07041, where indicated.
- M. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage. Color to match adjacent material colors.
- N. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.
  - 2. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
  - 3. Architect to select color and finish.
- O. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated hardwood or softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Rough Lumber Carriages for Stairs: Select Structural grade kiln dried to 15 percent maximum moisture content:
  - 1. Douglas fir-larch for non-visible locations.
  - 2. Wood species where indicated on Drawings.
- C. Rough Laminated Carriages for Stairs: Laminated veneer lumber, made with an exterior-type adhesive complying with ASTM D 2559, and with the following allowable design values as determined according to ASTM D 5456:
  - 1. Extreme Fiber Stress in Bending, Edgewise: 2850 psi (19.7 MPa) for 12-inch nominal- (286-mm actual-) depth members.
  - 2. Modulus of Elasticity, Edgewise: 1,800,000 psi (12 400 MPa).
- D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- E. Handrail Brackets: Cast from aluminum stainless steel with wall flange drilled for exposed anchor and tapped for concealed hanger bolt and with support arm for screwing to underside of rail. Sized to provide 1-1/2-inch (38-mm) clearance between handrail and wall.
- F. Handrail/Bumper Rail Brackets: Pairs of extruded-aluminum channels; one for fastening to back of rail and one for fastening to face of wall. They are then assembled in overlapping fashion and fastened together top and bottom with self-tapping screws. Sized to provide 1-1/2-inch (38-mm) clearance between handrail and wall.
- G. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- H. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
  - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

## 2.6 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members **3/4 Inch (19 mm)** Thick or Less: **1/16 inch (1.5 mm)**.
  2. Edges of Rails and Similar Members More Than **3/4 Inch (19 mm)** Thick: **1/8 inch (3 mm)**.
  3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: **1/16 inch (1.5 mm)**.
- E. Complete fabrication, including assembly, finishing, 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 (7) days in advance of the dates and times woodwork 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 indicated on Shop Drawings before disassembling for shipment.
- F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
1. Seal edges of openings in countertops with a coat of clear varnish.
- G. Install glass to comply with applicable requirements in Division 08 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.
- 2.7 INTERIOR STANDING AND RUNNING TRIM FOR STAINED OR TRANSPARENT FINISH
- A. Grade: Premium.
- B. Wood Species and Cut: Verify and match existing
1. Specie: Red Oak, Cherry, Maple, Birch, other.
  2. Cut: Plain sliced, rift-cut, rotary cut, quarter cut.
  3. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
- C. For trim items wider than available lumber, use veneered construction. Do not glue for width.
- D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
- E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- F. Assemble casings in plant except where limitations of access to place of installation require field assembly.

- G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.
- H. Fabricate/construct woodwork to details indicated on Drawings.

## 2.8 INTERIOR STANDING AND RUNNING TRIM FOR PAINTED OR OPAQUE FINISH

- A. Grade: Custom.
- B. Wood Species: Any closed-grain hardwood, Eastern white pine, sugar pine, or western white pine.
- C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- D. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- E. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

## 2.9 INTERIOR DOORS, FRAMES AND JAMBS FOR STAINED OR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Wood Species and Cut: Verify and match existing
  - 1. Species: Red Oak, Cherry, Maple, Birch.
  - 2. Cut: Plain sliced, rift cut.
- C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.
- D. Fire-Rated Interior Doors, Frames and Jambs: Products fabricated from fire-retardant particleboard or fire-retardant medium-density fiberboard with veneered, exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
  - 1. Coordinate with Door Schedule where indicated on Drawings.
  - 2. Fire Rating: 45 minutes, unless otherwise noted.

## 2.10 INTERIOR DOORS, FRAMES AND JAMBS FOR PAINTED OR OPAQUE FINISH

- A. Grade: Custom.
- B. Wood Species: Any closed-grain hardwood, Eastern white pine, sugar pine, or western white pine.
- C. Fire-Rated Interior Doors, Frames and Jambs: Products fabricated from fire-retardant particleboard or fire-retardant medium-density fiberboard with veneered, exposed surfaces and

listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Coordinated with Door Schedule where indicated on Drawings.
2. Fire Rating: 45 minutes, unless otherwise noted.

2.11 CUSTOM-BUILT PLASTIC-LAMINATE CABINETS  
(BASE AND WALL CABINETS, FURNITURE, ETC.)

- A. Grade: Custom.
- B. Door and Drawer Front Style: Flush overlay, unless otherwise indicated.
  1. Provide "felt" silencers.
  2. Provide cabinet locks, where indicated.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
  1. Horizontal Surfaces Other Than Tops: Grade HGS.
  2. Postformed Surfaces: Grade HGP.
  3. Vertical Surfaces: Grade HGS.
  4. Edges: PVC T-mold matching laminate in color, pattern, and finish, unless otherwise indicated.
- D. Materials for Semi-exposed Surfaces:
  1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
    - a. Edges of Plastic-Laminate Shelves: PVC T-mold matching laminate in color, pattern, and finish.
    - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
  2. Drawer Sides and Backs: Solid-hardwood lumber or Thermoset decorative panels.
  3. Drawer Bottoms: Hardwood plywood or Thermoset decorative panels.
- E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- F. 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 selected by Architect from laminate manufacturer's full range:
- G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.
- H. Fabricate/Construct woodwork to details indicated on Drawings.
  1. AWI Type of cabinet construction.

## 2.12 CUSTOM-BUILT PLASTIC-LAMINATE COUNTER TOPS

- A. Grade: Custom.
- B. High-Pressure Decorative Laminate Grade: HGS.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces.
  - 1. As selected by Architect from manufacturer's full range.
- D. Grain Direction: Parallel to cabinet fronts.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- F. Core Material: Exterior-grade plywood.
- G. Core Material at Sinks: Exterior-grade plywood.
- H. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of counter top substrate.
- I. Counter Tops and Backsplashes:
  - 1. Counter Tops – surfaces and edge-band on exposed edges with 1/16" plastic laminate over particleboard core, thickness after lamination 1-1/8 inch thick, or thicker as indicated. Shop fabricate tops using one-piece whenever possible and no transverse joints permitted with 24" of counter sinks.
    - a. Front edge-band shall be rounded 3 mm PVC strip flush with top counter surface and rounded underside flush with bottom of counter top.
    - b. Fabricate/Construct to details indicated on Drawings.
  - 2. Exposed front corner edges of counter tops shall be rounded with 1/2" minimum and 1" maximum radius at corners when counter tops are not abutting walls.
  - 3. Backsplash and Ends: Provide 4" x 5/8" high backsplash unless otherwise noted, and ends on all counter units to match counter top for job site installation.
  - 4. Contractor's Option: "Post-formed" backsplashes are acceptable.

## 2.13 CLOSET AND UTILITY SHELVING

- A. Grade: Custom.
- B. Shelf Material: 3/4-inch (19-mm) solid lumber.
- C. Cleats: 3/4-inch (19-mm) solid lumber.
- D. Wood Species: Any closed-grain hardwood or Eastern white pine, sugar pine, or western white pine.

## 2.14 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.

- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. General: Shop finish transparent-finished interior architectural woodwork at fabrication shop as specified in this Section. Refer to Division 09 painting Sections for finishing opaque-finished architectural woodwork.
- D. General: Drawings indicate items that are required to be shop finished. Finish such items at fabrication shop as specified in this Section. Refer to Division 09 painting Sections for finishing architectural woodwork not indicated to be shop finished.
- E. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. Refer to Division 09 "Painting" Sections for material and finishing application requirements.
- F. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.
- G. Transparent Finish:
1. Grade: Premium.
  2. AWI Finish System: Synthetic penetrating oil.
  3. AWI Finish System: Nitrocellulose lacquer.
  4. AWI Finish System: Catalyzed lacquer.
  5. AWI Finish System: Acrylic lacquer.
  6. AWI Finish System: Conversion varnish.
  7. AWI Finish System: Catalyzed vinyl.
  8. AWI Finish System: Catalyzed polyurethane.
  9. AWI Finish System: Two-component polyester.
  10. Staining: Match approved sample for color or Match Architect's sample.
  11. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
  12. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
  13. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
    - a. Apply wash-coat sealer after staining and before filling.
  14. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.
- H. Opaque Finish:
1. Grade: Custom.
  2. AWI Finish System: Nitrocellulose lacquer.
  3. AWI Finish System: Catalyzed lacquer.
  4. AWI Finish System: Acrylic lacquer.
  5. AWI Finish System: Conversion varnish.
  6. AWI Finish System: Catalyzed vinyl.
  7. AWI Finish System: Catalyzed polyurethane.



8. AWI Finish System: Two-component polyester.
9. Color: As selected by Architect from manufacturer's full range.
10. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

2.15 Ballistic Armor:

A. Provide 'non-ricochet type" bullet resistant fiberglass composite sheeting fabricated by a process of mechanically injecting a woven roving ballistic grade fiberglass cloth with a thermoset polyester resin and compressing (using a hydraulic hot press) the impregnated cloth and resins into sheets. Refer to drawings for locations.

1. Form: Opaque, flat rigid sheets approximately 5/16-inch thick.

2. Protection Level: 0.357 magnum, 158-gr, softpoint, 1450-ft/sec; 9-mm Auto 124-gr full metal jacket, 1175-ft/sec.

11.3. Rating: UL 752, Level II HPSA and NIJ 0108.01, Type II-A.

4. 1 hour fire rated ASTM E119-00a

12.5. Manufacturer:

a. Armortex Bullet resistant composite Armor as manufactured by Armortex, Schertx, TX 78154;

b. Armorcure Bullet Resistant panels as manufactured by Waco Composites. Ltd. Waco TX 76710 or approved equal.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

### 3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than **36 inches (900 mm)** long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
  2. Install wall railings on indicated metal brackets securely fastened to wall framing.
  3. Install standing and running trim with no more variation from a straight line than **1/8 inch in 96 inches (3 mm in 2400 mm)**.
- H. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless otherwise indicated.
1. Install flush paneling with no more than **1/16 inch in 96-inch (1.5 mm in 2400-mm)** vertical cup or bow and **1/8 inch in 96-inch (3 mm in 2400-mm)** horizontal variation from a true plane.
- I. Stairs: Securely anchor carriages to supporting substrates. Install stairs with treads and risers no more than **1/8 inch (3 mm)** from indicated position.
- J. Railings:
1. General: Install rails with no more than **1/8 inch in 96-inch (3 mm in 2400-mm)** variation from a straight line.
  2. Stair Rails: Glue and dowel or pin balusters to treads and railings, and railings to newel posts.
  3. Wall Rails: Support rails on indicated metal brackets securely fastened to wall framing.
    - a. Space rail brackets not more than 48 inches on-center.
- K. Cabinets: Install without distortion so doors and drawers fit openings properly 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.
1. Install cabinets with no more than **1/8 inch in 96-inch (3 mm in 2400-mm)** sag, bow, or other variation from a straight line.
  2. Maintain veneer sequence matching of cabinets with transparent finish.
  3. Fasten wall cabinets through back, near top and bottom, at ends and not more than **16 inches (400 mm)** o.c. with No. 10 wafer-head screws sized for **1-inch (25-mm)** penetration into wood framing, blocking, or hanging strips, No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish, toggle bolts through metal backing or metal framing behind wall finish.
- L. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  2. Install countertops with no more than **1/8 inch in 96-inch (3 mm in 2400-mm)** sag, bow, or other variation from a straight line.
  3. Secure backsplashes to tops with concealed metal brackets at **16 inches (400 mm)** o.c. and to walls with adhesive.
  4. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- M. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- N. Refer to Division 09 "Painting" Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 4023.L

## SECTION 07 2100 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes, but not limited to the following:
  - 1. Perimeter insulation under slabs-on-grade.
  - 2. Rigid wall insulation
  - 3. Air infiltration barrier (Air Barrier).
  - 4. Note: For roof insulation; refer to Roofing Specification types.
- B. Related Sections include the following:
  - 1. Division 04 2000 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Plenum Rating: Provide slag-wool-fiber/rock-wool-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
  - 1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm (13-m/s) air velocity.
  - 2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84.
  - 2. Fire-Resistance Ratings: ASTM E 119.
  - 3. Combustion Characteristics: ASTM E 136.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by 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 plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
    - a. Manufacturers:
      - 1 Dow Chemical Company.
      - 2 Owens Corning.
      - 3 Pactiv Building Products Division
      - 4 Johns Manville Corp.
      - 5 Celotex Corp.
      - 6 Thermafiber
      - 7 U.S. Gypsum Co.

## 2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
  2. Insulation Criteria: Provide insulation at all exterior building walls, even if drawings do not indicate insulation. Provide insulation thickness with minimum R-values indicated.
    - a. Walls and Vertical locations: R=10 (min.), unless otherwise specified or indicated on drawings.
    - b. Roofs and Horizontal locations: R=19 (min.) unless otherwise indicated on drawings.

## 2.3 FOAM-PLASTIC BOARD INSULATION

- A. Under Concrete Slab Insulation (Horizontal Installation): Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:
1. Perimeter Building Footprint – Horizontal Installation: Under-concrete Slab-on-grade Insulation: Extruded-closed-cell polystyrene insulation ASTM C 578. Type IV or Type V for standard weight pedestrian areas and Type VII for under heavy-loaded vehicular traffic locations. Density = 25 minimum.
    - a. Manufacturer's Product: "Dow Styrofoam Highload 40" Extruded Polystyrene Insulation. 2 inch (R -10 min.) or equal to comply with traffic weight locations..
    - b. Minimum Thickness: 2 inches (R=10.0 min.). Acceptable Product: "Owens-Corning Foamalar-250" or equal to comply with traffic weight locations.
- B. Rigid Wall and Soffit Insulation
1. Dow Styrofoam Brand Ultra SL
    - a. Thickness: 1 ¾"
    - b. R-value: 10
    - c. Board size: 48" x 96" shiplap
    - d. Min. compressive strength: 25 psi
    - e. Joint tape: Weathermate straight flashing
- C. Roofing Insulation Systems:
1. Refer to Division 07 Section "Roofing" for insulation specified in roofing types in this Project.

## 2.4 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER BOARD INSULATION

- A. Curtain Wall Insulation: Foil-Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 5, respectively; and of the following nominal density and thermal resistivity:
1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
  2. Minimum R-value: R = 5.0 at 75 degrees.

## 2.5 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER BLANKET INSULATION

- A. Sound Attenuation Abatement Insulation: Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
  - 1. For Fire-Rated Locations: Unfaced mineral fiber batts or blanket insulation complying with ASTM C-665, Type 1 and ASTM C-136 for fire-rated conditions.
- B. Exterior Perimeter Enclosure Walls (Metal-framed installation): Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.
- C. Fire-safing Insulation: Unfaced safing insulation 5" minimum depth held in place with impaling clips or other approved supports for fire-rated separation as indicated on drawing and as required for fire-safing to stay-in-place.
- D. Curtain Wall Fire-Safing Insulation Wall Systems:
  - 1. Provide "Thermalfiber" foil-faced or "Firespan" insulation behind spandrel panels areas and where indicated with metal impaling pins or other acceptable mechanical attachment systems to hold fire-safing in place.
  - 2. Provide vapor and smoke-seal applications on fire-safing.
  - 3.

## 2.6 SPRAY-APPLIED CELLULOSIC INSULATION

- A. Self-Supported, Spray-Applied Cellulosic Insulation: ASTM C 1149, **Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications)**, chemically treated for flame-resistance, processing, and handling characteristics.

## 2.7 VAPOR RETARDERS

- A. Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than **25 lb/1000 sq. ft. (12 kg/100 sq. m)**, with maximum permeance rating of **0.0507 perm (2.9 ng/Pa x s x sq. m)**.
  - 1. Vapor Retarder – Standard (Underslab General Areas): Standard Multi-ply reinforced polyethylene sheet, ASTM E 1745, Class C, not less than 7.8 mils (0.18 mm) thick; or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick.
    - a. Manufacturers: "Fortifiber or Raven Industries."
    - b. Other manufacturers complying to specified requirements, acceptable to the Architect.
  - 2. Vapor Retarder – Heavy-Duty (Underslab at wood flooring and swimming pool deck areas): Heavy-Duty. ASTM E-1745-97 Class C, of non-woven geotextile laminated with polyethylene to a low-perm membrane not less than 15 mils (0.29 mm) thick.

- a. Manufacturers technical criteria; "Fortifiber – Moistop Plus" underslab vapor retarder or "Raven Industries" – Vapor Block-15 or acceptable equal by other manufacturers.
  - b. Other manufacturers complying to specified requirements and acceptable to the Architect.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- D. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.
- E. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and with demonstrated capability to bond vapor retarders securely to substrates indicated.
- 2.8 AIR INFILTRATION BARRIER (Air Barrier)
- A. Manufacturer's Products: Subject to compliance with requirements, products that may be incorporated into the work include, but not limited, to the following:
- 1. DuPont, Tyvek Homewrap.
  - 2. Tenneco; Amowrap.
  - 3. Carlisle Coatings and Waterproofing.
- B. Provide air infiltration barrier at exterior side of exterior building wall sheathing.
- 2.9 AUXILIARY INSULATING MATERIALS
- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.
- 2.10 INSULATION FASTENERS
- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place:
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.



- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of **1 inch (25 mm)** between face of insulation and substrate to which anchor is attached.
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

### 3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

### 3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

### 3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
  - 1. If not otherwise indicated, extend insulation a minimum of **24 inches (610 mm)** below exterior grade line.
  - 2. Provide 1/4 inch asphaltic protection board course with jointed butted to protect below-grade insulation on vertical surfaces from damage during backfilling operations.
- B. Perimeter Building Footprint Insulation: Provide horizontal rigid insulation under concrete slab-on-grade at inside perimeter of all building footprint foundation walls.

1. Install a 2 inch thick rigid insulation board at least 24 inches wide. Protect top surface of insulation from damage during concrete work.
- C. On horizontal surfaces, butt joints of loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

### 3.5 INSTALLATION OF CAVITY-WALL INSULATION

- A. On units of foam-plastic board insulation, install pads of adhesive spaced approximately **24 inches (610 mm)** o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates indicated.
1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04 Section "Unit Masonry."

### 3.6 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated.
1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
  2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  3. Maintain **3-inch (76-mm)** clearance of insulation around recessed lighting fixtures.
  4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
  5. For metal-framed wall cavities where cavity heights exceed **96 inches (2438 mm)**, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs at least 24 inches on-center.
- E. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to

- insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
  3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
  4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- F. Apply self-supported, spray-applied cellulosic insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it flush with face of studs by using method recommended by insulation manufacturer.
- G. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

### 3.8 INSTALLATION OF FIRE-CONTAINMENT SYSTEMS

- A. Perimeter Locations: Install perimeter fire-containment systems to fill gap between edge of concrete floor slab and back of spandrel panels of exterior curtain-wall systems to comply with Building codes and other agencies having jurisdiction.
- B. Other Fire-Rated Locations: Install fire-containment systems at top of partitions to fill gaps between wall and the deck above.
- C. Install fire-sealer on the fire-safing materials at the fire-separation conditions for a vapor-tight and smoke-tight condition.
- D. Provide impaling clips or other approved mechanical methods to support and hold the fire-safing material in place.

### 3.10 INSTALLATION OF VAPOR RETARDERS

- H. General: Extend vapor-retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor-retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- I. Seal vertical joints in vapor-retarders over framing by lapping not less than two wall studs. Fasten vapor-retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (400 mm) o.c.
- J. Before installing vapor-retarder, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor-retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.

- K. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- L. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor-retarder.
- M. Repair tears or punctures in vapor-retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor-retarder.

3.11 ACTION

- N. Protect installed insulation and vapor-retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 2100

SECTION 07 8413 - PENETRATION FIRESTOPPING  
(FIRESTOPPING AND SMOKE STOPPING SYSTEMS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Fires-topping Assemblies for:
1. Floors and Roofs.
  2. Fire-stopping and Smoke-stopping systems.
  3. Walls and partitions.
  4. Smoke barrier partitions.
  5. Perimeter building walls (exterior and interior)
  6. Curtain walls.
  7. Penetration Fire-stop System Schedule.
- C. Related Sections include, but not limited to the following:
1. Division 07 8413 Section "Penetration Firestopping" for fire-rated resistance construction.
  2. Division 09 2116 Section "Gypsum board Shaft-wall assemblies"
  3. Division 21 Sections "Mechanical" specifying fire-suppression piping penetrations.
  4. Division 22 and 23 Sections "Mechanical" specifying duct and piping penetrations.
  5. Division 26, 27, and 28 Sections "Electrical" specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
1. Fire-resistance-rated walls including fire walls, fire partitions, fire barriers, and smoke barriers.
  2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration fire-stop systems with the following ratings determined per ASTM E 814 or UL 1479:

1. F-Rated Systems (fire-stop system withstood the fire test for the rating period): Provide through-penetration fire-stop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
  2. T-Rated Systems (heat transmitted through the fire-stop system during the rating period did not raise temperature): For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
    - a. Penetrations located outside wall cavities.
    - b. Penetrations located outside fire-resistance-rated shaft enclosures.
  3. L-Rated Systems (amount of air-leakage through the fire-stop system): Where through-penetration fire-stop systems are indicated in smoke barriers, provide through-penetration fire-stop systems with L-ratings indicated of not more than **3.0 cfm/sq. ft (0.01524cu. m/s x sq. m)** at both ambient temperatures and **400 deg F (204 deg C)**.
- C. For through-penetration fire-stop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration fire-stop systems.
  2. For floor penetrations with annular spaces exceeding **4 inches (100 mm)** in width and exposed to possible loading and traffic, provide fire-stop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
  3. For penetrations involving insulated piping, provide through-penetration fire-stop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- 1.4 SUBMITTALS
- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration fire-stop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include fire-stop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration fire-stop system configuration for construction and penetrating items.
  2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration fire-stop condition, submit illustration, with modifications marked, approved by through-penetration fire-stop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Through-Penetration Fire-stop System Schedule: Indicate locations of each through-penetration fire-stop system, along with the following information:
1. Types of penetrating items.

2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
  3. Through-penetration fire-stop systems for each location identified by fire-stop design designation of qualified testing and inspecting agency.
- D. Product Certificates: For through-penetration fire-stop system products, signed by product manufacturer.
- E. Product Test Reports: From a qualified testing agency indicating through-penetration fire-stop system complies with requirements, based on comprehensive testing of current products.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Fire-stop Contractors."
- B. Installer Qualifications: A firm in continuous business at least three (3) years experienced in installing through-penetration fire-stop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.
1. Installer shall be approved by the product manufacturer to install product.
- C. Installation Responsibility: Assign installation of through-penetration fire-stop systems and fire-resistive joint systems in Project to a single qualified installer.
- D. Source Limitations: Obtain through-penetration fire-stop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- E. Fire-Test-Response Characteristics: Provide through-penetration fire-stop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
1. Fire-stopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for fire-stop systems acceptable to authorities having jurisdiction.
  2. Through-penetration fire-stop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 3100 Section "Project Management and Coordination."

#### 1.6 MOCK-UP

- A. Install "in-place" fire-stopping assembly for each fire-rating design required on the project.
1. Secure local building department's approval or authority having jurisdiction before proceeding with further installation.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration fire-stop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials for through-penetration fire-stop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration fire-stop systems when ambient or substrate temperatures are outside limits permitted by through-penetration fire-stop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration fire-stop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

## 1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration fire-stop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire-stop systems.
- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration fire-stop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration fire-stop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

## 1.10 WARRANTY

- A. Products must come with a 1 year manufacturer's warranty and must have a minimum shelf life of 1 year.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturer's Products: Subject to compliance with requirements, provide one of the through-penetration fire-stop systems indicated for each application that are produced by one of the following manufacturers:



1. Metacaulk
2. A/D Fire Protection Systems Inc.
3. Grace, W. R. & Co. - Conn.
4. Hilti, Inc.
5. Johns Manville.
6. Nelson Fire-stop Products.
7. DAP.
8. RectorSeal Corporation (The).
9. Specified Technologies Inc.
10. 3M; Fire Protection Products Division.
11. Tremco; Sealant/Weatherproofing Division.
12. USG Corporation.

## 2.2 FIRESTOPPING, GENERAL

- A. **Compatibility:** Provide through-penetration fire-stop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration fire-stop systems, under conditions of service and application, as demonstrated by through-penetration fire-stop system manufacturer based on testing and field experience.
- B. **Accessories:** Provide components for each through-penetration fire-stop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration fire-stop system manufacturer and approved by qualified testing and inspecting agency for fire-stop systems indicated. Accessories include, but are not limited to, the following items:
  1. Permanent forming/damming/backing materials, including the following:
    - a. Slag-/rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Fillers for sealants.
  2. Temporary forming materials.
  3. Substrate primers.
  4. Collars.
  5. Steel sleeves.

## 2.3 FILL MATERIALS

- A. **General:** Provide through-penetration fire-stop systems containing the types of fill materials indicated in the Through-Penetration Fire-stop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. **Cast-in-Place Fire-stop Devices:** Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Fire-stop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. 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.
- I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
  - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
  - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

## 2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration fire-stop systems to comply with fire-stop system manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration fire-stop systems.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration fire-stop systems. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration fire-stop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration fire-stop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-stop system materials. Remove tape as soon as possible without disturbing fire-stop system's seal with substrates.

### 3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration fire-stop systems to comply with Part 1 "Performance Requirements" Article and with fire-stop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing 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 indicated as permanent components of firestop systems.
- C. Install fill materials for fire-stop systems by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 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 Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Identify through-penetration fire-stop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within **6 inches (150 mm)** of edge of the fire-stop systems so that labels will be visible to anyone seeking to remove penetrating items or fire-stop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
  1. The words "Warning - Through-Penetration Fire-stop System - Do Not Disturb. Notify Building Management of Any Damage."
  2. Contractor's name, address, and phone number.
  3. Through-penetration fire-stop system designation of applicable testing and inspecting agency.
  4. Date of installation.
  5. Through-penetration fire-stop system manufacturer's name.
  6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration fire-stops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration fire-stop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration fire-stop systems with other construction only after inspection reports are issued and fire-stop installations comply with requirements.

### 3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration fire-stop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration fire-stop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration fire-stop systems immediately and install new materials to produce systems complying with specified requirements.

### 3.7 GENERAL - PENETRATION FIRESTOPPING

- A. Compatibility: Provide through-penetration Fire-stop and Sealer Systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration Fire-stop and Sealer Systems, under conditions of service and application,

as demonstrated by through-penetration Fire-stop System Manufacturer based on testing and field experience. Provide and install compatible Sealers.

- B. Accessories: Provide components for each through-penetration Fire-stop System that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration Fire-stop System Manufacturer and approved by the qualified testing and inspecting agency for Fire-stop Systems indicated. Accessories include, but are not limited to, the following systems:

### 3.8 FIRE-STOPPING SYSTEMS SCHEDULE

Note: The UL Design Numbers are noted for reference only; other UL Design Systems may be installed to suit required fire-ratings.

- a. Fire-stopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches (100 mm) or less: Any specified acceptable material manufacturers meeting requirements.
  - 1) Concrete Floor and Concrete Block Walls: UL Design No. C-AJ-1000 Series.
    - a) One (1) hour rating: UL Design No. C-AJ-1013.
    - b) Two (2) hour rating: UL Design No. C-AJ-1014.
  - 2) Gypsum Corridor and Separation Walls: UL Design No. W-L-1000 Series.
    - a) One (1) hour rating: UL Design No. W-L-1039.
    - b) Two (2) hour rating: UL Design No. W-L-1040.
- b. Fire-stopping at Combustible Pipe and Conduit Penetrations, of diameter 4 inches (100 mm) or less: Any specified acceptable material manufacturers meeting requirements.
  - 1) Concrete Floor and Concrete Block Walls: UL Design No. C-AJ-2000 Series.
    - a) One (1) or two (2) hour rating: UL Design No. UL Design No. C-AJ-2082.
  - 2) Gypsum Corridor and Separation Walls: UL Design No. W-L-2000 Series.
    - a) One (1) hour rating: UL Design No. UL Design No. W-L-2036.
    - b) Two (2) hour rating: UL Design No. UL Design No. W-L-2060.
- c. Fire-stopping at Cable Penetrations, not in Conduit or Cable Tray: Any specified acceptable material manufacturers meeting requirements.
  - 1) Concrete Floors and Concrete Block Walls: UL Design No. C-AJ-3000 Series.
    - a) One (1) and two (2) hour rating: UL Design No. C-AJ-3022.
  - 2) Gypsum Corridor and Separation Walls: UL Design No. W-L-3000 Series.
    - a) One (1) hour rating: UL Design No. W-L-3046.
    - b) Two (2) hour rating: UL Design No. W-L-3048.
- d. Fire-stopping at Cable Tray Penetrations: Any specified acceptable material manufacturers meeting requirements.
  - 1) Concrete Floors and Concrete Block Walls: UL Design No. C-AJ-4000 Series.

- a) One (1) and two (2) hour rating: UL Design No. C-AJ-4025.
- 2) Gypsum Corridor and Separation Walls: UL Design No. W-L-4000 Series.
  - a) One (1) hour rating: UL Design No. W-L-4006.
  - b) Two (2) hour rating: UL Design No. W-L-4009.
- e. Fire-stopping at Control Joints (without Penetrations): Any specified acceptable material manufacturers meeting requirements.
  - 1) Between top of fire rated walls and bottom of slab above: UL Design No. HWD0000 Series and HWD1000 Series.
  - 2) Manufacturers: Flexible and sprayable seal; 3M Firedam Spray by 3M or AS105 for Perimeter Joints by Specified Technologies.
  - 3) USG Fire-stop System Thermafiber Fire-safing: 8 lbs. density mineral wool.
- f. Fire-stopping Between Edge of Floor Slab and Curtain Wall (without Penetrations): Glass fiber or mineral fiber safing insulation; Omega Point Design No. CEJ118P or AS105.
  - 1) Meet (CEJ116P) or (CEJ118P) for rated joints. Provide flexible seal with compression/extension of plus/minus percent of original joint width; 3M Fire Dam Spray for Perimeter Joints by 3M or AS105 for Perimeter Joints by Specified Technologies.
  - 2) USG Firestop System Thermafiber Fire-safing: 8 lbs. density mineral wool.
  - 3) Provide metal impaling clips at 24" o.c. or other approved method to contain fire-safing material from falling-out or separating.
  - 4) Perimeter Fire Containment Systems abutting gypsum board: UL Design Series No. CW-S-1000 Series.
    - a) One (1) hour rating: UL Design No. CW-S-1001.
    - b) Two (2) hour rating: UL Design No. CW-S-1002.
  - 5) Perimeter Fire Containment Systems abutting rigid insulation at spandrel areas: UL Design No. CW-S-2000 Series.
    - a) One (1) hour rating: UL Design No. CW-S-2001.
    - b) Two (2) hour rating: UL Design No. CW-S-2002.
- g. Temporary Fire-stopping: Intumescent pillows; UL Design No. CAJ4000 Series or WL4000 Series, F Rating 1-1/2 hour.
- h. Fire-stopping at head-of-wall gypsum board metal stud partition to fluted metal deck: UL Design No. HW-D-0000 Series.
  - 1) One (1) hour rating: UL Design No. HW-D-0001.
  - 2) Two (2) hour rating: UL Design No. HW-D-0002.
- i. Fire-stopping at head-of-wall concrete block (CMU) wall partition to fluted metal deck: UL Design No. HW-D-0009 Series.
  - 1) One (1) or two (2) hour rating: UL Design No. HW-0009.

### 3.9 PENETRATION FIRESTOP SYSTEM UL-CLASSIFIED REFERENCES

- A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

- B. Fire-stop Systems for Metallic Pipes, Conduit, or Tubing FS-1: Comply with:
  - 1. UL-Classified Systems: C-AJ-1001-1999.
- C. Fire-stop Systems for Metallic Pipes, Conduit, or Tubing FS-2: Comply with:
  - 1. UL-Classified Systems: W-L-1001-1999.
- D. Fire-stop Systems for Nonmetallic Pipe, Conduit, or Tubing FS-3: Comply with:
  - 1. UL-Classified Systems: C-AJ-2001-2999.
- E. Fire-stop Systems for Electrical Cables FS-4: Comply with:
  - 1. UL-Classified Systems: C-AJ-3001-3999.
- F. Fire-stop Systems for Insulated Pipes FS-5: Comply with:
  - 1. UL-Classified Systems: C-AJ-5001-5999.
- G. Fire-stop Systems for Insulated Pipes FS-6: Comply with:
  - 1. UL-Classified Systems: W-L-5001-5999.
- H. Fire-stop Systems for Miscellaneous Mechanical Penetrations FS-7: Comply with:
  - 1. UL-Classified Systems: C-AJ-7001-7999.

END OF SECTION 07 8413

## SECTION 07 9200 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes joint sealants for the following applications:
  - 1. Exterior joints in, but not limited to the following vertical surfaces and horizontal non-traffic surfaces:
    - a. Construction joints in cast-in-place concrete.
    - b. Joints between plant-precast architectural concrete units.
    - c. Control and expansion joints in unit masonry.
    - d. Joints in dimension stone cladding.
    - e. Joints in glass unit masonry assemblies.
    - f. Joints in exterior insulation and finish systems.
    - g. Joints between metal panels.
    - h. Perimeter joints between frames of doors, windows, and louvers.
    - i. Control and expansion joints in ceilings and other overhead surfaces.
    - j. Joints between cast stone cladding and unit masonry assemblies.
  - 2. Exterior joints in but not limited to the following horizontal Pedestrian and Vehicular traffic surfaces:
    - a. Control and expansion joints in brick pavers.
    - b. Isolation and contraction joints in cast-in-place concrete slabs.
    - c. Joints between plant-precast structural and architectural concrete paving units.
    - d. Joints in stone paving units, including steps.
    - e. Tile control and expansion joints.
  - 3. Interior joints in, but not limited to the following vertical surfaces and horizontal non-traffic surfaces:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings.
    - c. Tile control and expansion joints.
    - d. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls, and partitions.
    - e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
    - f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
  - 4. Interior joints in but not limited to the following horizontal traffic surfaces:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Control and expansion joints in stone flooring.
    - c. Control and expansion joints in brick flooring.



d. Control and expansion joints in tile flooring.

B. Related Sections include the following:

1. Division 03 3000 Section "Cast-in-Place Concrete" for joints in concrete.
2. Division 03 4100 Section "Precast Structural Concrete" for architectural and structural concrete.
3. Division 04 2000 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
4. Division 07 8413 Section "Penetration Fireproofing" for sealing joints in fire-resistance-rated construction.
5. Division 08 8000 Section "Glazing" for glazing sealants.
6. Division 09 2900 Section "Gypsum Board" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
7. Division 09 3000 Section "Tiling" for sealing ceramic type tile joints.
8. Division 095123 Section "Acoustical Tile Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

### 1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in **1/2-inch- (13-mm-)** wide joints formed between two **6-inch- (150-mm-)** long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- D. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
  1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Warranties: Special warranties specified in this Section.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer in continuous business at least three (3) years who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Mockups: Build in-place mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
  - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 3100 Section "Project Management and Coordination."

## 1.6 PROJECT 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 (5 deg C)**.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
  - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
  - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturer's Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
  1. Manufacturer's sealant products are indicated for Manufacturer's "Basis of Design" only. Other manufacturer's products complying to specified criteria comparable to the Basis of Design Product will be reviewed for acceptability.
- B. Silicone Sealants (Low-Modulus)
  1. Dow Corning Corp.
  2. GE Silicones
  3. Pecora
- C. Acrylic Emulsion Latex Sealants
  1. Pecora
  2. Tremco
  3. Sonneborn Building Products
- D. Polyurethane Sealants
  1. Sika Corp.
  2. Pecora
  3. Sonneborn Building Products
  4. Tremco

### 2.2 MATERIALS, 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 sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
  1. Vertical Joint Sealant Color: Provide color to match as closely as possible the brick or Masonry unit (CMU) color. Where two brick colors are in the same façade, provide sealant colors to closely match each brick area.
  2. Horizontal Joint Sealant Color: Provide color to match the grout color.

### 2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

## 2.4 SEALANT TYPES

- A. Manufacturer's products indicated are Basis of Design. Other manufacturers products complying to specified criteria will be considered.
- B. Silicone Sealant for Exterior: ASTM C 920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, neutral curing, non-sagging, non-staining, fungus resistant, non-bleeding.
  - 1. Product: 790 manufactured by Dow Corning Building Sealant.
  - 2. Movement Capability: Plus 100 percent, minus 25 percent.
  - 3. Service Temperature Range: -65 to 180 degrees F (-54 to 82 degrees C).
  - 4. Shore A Hardness Range: 15 to 35.
  - 5. Location Applications:
    - a. Exterior joints.
    - b. Control, expansion and soft joints in masonry.
    - c. Joints between concrete and other materials.
    - d. Joints between metal frames and other materials.
    - e. Butt glazing.
    - f. Joints between precast architectural and precast structural concrete joints with precast concrete and other materials.
- C. Silicone Sealant for Butt Glazing: ASTM C 920, Grade NS, Class 25, Uses NT and A; single component, neutral curing, non-sagging, non-staining, fungus resistant, non-bleeding.
  - 1. Product: 983 Silicone Building and Glazing Sealant by Dow Corning.
  - 2. Location Applications:
    - a. Curtain Walls.
    - b. Storefronts.
    - c. Windows glass.
- D. Silicone Sealant for Structural Glazing: ASTM C 1184.
  - 1. Product: 995, silicone structural sealant by Dow Corning.
  - 2. Location Application:
    - a. Structural sealant for butt glazed glass.
    - b. Glass to aluminum framing.
- E. Fixtures/Tile Sealant: Silicone; ASTM C 920, Uses M, NT, O and A; single component, mildew resistant.

1. Product: 786 Mildew Silicone Sealant manufactured by Dow Corning.
  2. Product: Sanitary 1700 manufactured by GE Silicones.
  3. Location Applications: Interior uses only.
    - a. Joints between plumbing fixtures and floor and wall surfaces.
    - b. Joints between kitchen and bath counter tops and wall surfaces.
    - c. Joints between counter tops (with sinks) and wall surfaces.
    - d. Color to match adjacent materials.
- F. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, single component, paintable.
1. Product: Sonolac manufactured by Sonneborn Building Products Div.
  2. Product: Tremco Acrylic Latex 834 manufactured by Tremco Inc.
  3. Product: AC-20 manufactured by Pecora Corp.
  4. Location Applications:
    - a. Interior wall and ceiling control joints.
    - b. Joints between door and window frames and wall surfaces.
    - c. Joints between casework and adjacent surfaces.
    - d. Other interior joints for which no other type of sealant is indicated.
- G. Interior Floor Joint Sealant: Polyurethane, self-leveling: ASTM C 920, Grade P, Class 25, Uses T, M, O and A, multi-component.
1. Approved by manufacturer for wide joints up to 1-1/2 inches.
  2. Product: SL2 manufactured by Sonneborn Building Products Div.
  3. Location Applications:
    - a. Expansion joints in floors.

## 2.5 SOLVENT-RELEASE JOINT SEALANTS

- A. Acrylic-Based Solvent-Release Joint Sealant: Comply with ASTM C 1311 or FS TT-S-00230.
1. Manufacturer's Products:
    - a. Schnee-Moorehead, Inc.; Acryl-R Acrylic Sealant.
    - b. Tremco; Mono 555.
    - c. Other manufacturers acceptable to the Architect.
- B. Butyl-Rubber-Based Solvent-Release Joint Sealant: Comply with ASTM C 1085.
1. Manufacturer's Products:
    - a. Bostik Findley; Bostik 300.
    - b. Fuller, H. B. Company; SC-0296 or SC-0288.
    - c. Pecora Corporation; BC-158.
    - d. Polymeric Systems Inc.; PSI-301
    - e. Sonneborn, Division of ChemRex Inc.; Sonneborn Multi-Purpose Sealant.
    - f. Tremco; Tremco Butyl Sealant.
- C. Pigmented Narrow-Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented, synthetic-rubber sealant complying with AAMA 803.3 and formulated for sealing joints **3/16 inch (5 mm)** or smaller in width.

1. Manufacturer's Products:
  - a. Fuller, H. B. Company; SC-0289.
  - b. Schnee-Morehead, Inc.; SM 5504 Acryl-R Narrow Joint Sealant.
  - c. Other manufacturers acceptable to the Architect.

## 2.6 LATEX JOINT SEALANTS

- A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.
- B. Manufacturer's Products:
  1. Bostik Findley; Chem-Calk 600.
  2. Pecora Corporation; AC-20+.
  3. Schnee-Morehead, Inc.; SM 8200.
  4. Sonneborn, Division of ChemRex Inc.; Sonolac.
  5. Tremco; Tremflex 834.

## 2.7 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
  1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  2. Manufacturer's Products:
    - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
    - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
  1. Manufacturer's Products:
    - a. Pecora Corporation; BA-98.
    - b. Tremco; Tremco Acoustical Sealant.
    - c. Other manufacturers acceptable to the Architect.

## 2.8 PREFORMED JOINT SEALANTS

- A. Preformed Silicone-Sealant System: Manufacturer's standard system consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
  1. Manufacturer's Products:
    - a. Dow Corning Corporation; 123 Silicone Seal.
    - b. GE Silicones; UltraSpan US1100.
    - c. Pecora Corporation; Sil-Span.

d. Tremco; Spectrem Ez Seal.

- B. Preformed Foam Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant that is manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; is factory produced in precompressed sizes in roll or stick form to fit joint widths indicated; is coated on one side with a pressure-sensitive adhesive and covered with protective wrapping; develops a watertight and airtight seal when compressed to the degree specified by manufacturer; and complies with the following:
1. Manufacturer's Products:
    - a. EMSEAL Joint Systems, Ltd.; Emseal 25V.
    - b. illbruck Sealant Systems, Inc.; Wilseal 600.
    - c. Polytite Manufacturing Corporation; Polytite B.
    - d. Polytite Manufacturing Corporation; Polytite Standard.
    - e. Sandell Manufacturing Co., Inc.; Polyseal.
  2. Properties: Permanently elastic, mildew resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
    - a. Density: Manufacturer's standard.

## 2.9 PREFORMED TAPE SEALANTS

- A. Back-Bedding Mastic Tape Sealant: Preformed, butyl-based elastomeric tape sealant with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800.
- B. Expanded Cellular Tape Sealant: Closed-cell, PVC foam tape sealant; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800.

## 2.10 JOINT-SEALANT BACKING (BACKER ROD)

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to **minus 26 deg F (minus 32 deg C)**. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

- D. 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 where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.11 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant 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 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, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous 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.
- B. Joint Priming: Prime joint substrates, where required, based on 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 with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. 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.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified 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, unless otherwise indicated.
- H. Installation of Preformed Tapes: Install according to manufacturer's written instructions.
- I. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
  - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
  - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a

bonding area of not less than **3/8 inch (10 mm)**. Hold edge of sealant bead **1/4 inch (6 mm)** inside masking tape.

3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

- J. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

### 3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates.
1. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 9200

## SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Hollow doors and frames.
  - 2. Sidelight frames
  - 3. Borrowed-light frames.
  - 4. Fire-rated door and frame assemblies.
  - 5. Louvers in doors.
- B. Related Sections include the following:
  - 1. Division 04 2000 Section "Unit Masonry" for installing anchors and grouting frames in masonry construction.
  - 2. Division 05 4000 Section "Formed-Metal Fabrications" for customized hollow-metal work other than doors, panels, and frames.
  - 3. Division 08 1416 Section "Flush Wood Doors" for wood doors installed in steel frames.
  - 4. Division 08 7200 Section "Door Hardware" for door hardware and weather stripping.
  - 5. Division 08 8000 Section "Glazing" for glass in glazed openings in doors and frames.
  - 6. Division 09 2900 Section "Gypsum Board" for spot-grouting frames installed in steel-framed gypsum board partitions.
  - 7. Division 09 9100 Section "Painting" for field painting factory-primed doors and frames.

#### 1.3 DEFINITIONS

- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.
- B. Steel Door Institute (SDI): SDI Level for minimum steel sheet thickness for door faces.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
- B. Shop Drawings: Show the following:

1. Elevations of each door design.
2. Details of doors including vertical and horizontal edge details.
3. Frame details for each frame type including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Coordination of glazing frames and stops with glass and glazing requirements.

C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

D. Oversize Construction Certificates: For door assemblies required to be fire-protection rated and exceeding size limitations of labeled assemblies.

## 1.5 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage.

B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Remove and replace damaged items.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to permit air circulation and ventilation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hollow Doors and Frames:
  - a. Amweld Building Products, Inc.
  - b. Ceco Door Products; a United Dominion Company.
  - c. Detroit Door.
  - d. Pioneer Industries Inc.
  - e. Republic Builders Products.
  - f. Steelcraft; a division of Ingersoll-Rand.
  - g. Mesker Door Incorporated.

## 2.2 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.
- D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

## 2.3 HOLLOW METAL DOORS

- A. General: Provide doors of sizes, thicknesses, and designs indicated per SDI level ratings.
- B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:
  - 1. Level-2 and Physical Performance Level-B (Heavy Duty), Model-1 (Full Flush).
  - 2. Steel thickness: 18 gauge, fully welded unit.
  - 3. Fire-rated doors and door frames where indicated in Schedule. Provide UL -label.
- C. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
  - 1. Level-3 and Physical Performance Level-A (Extra Heavy Duty), Model-2 (Seamless).
  - 2. Steel thickness: galvanized 16 gauge, fully welded unit.
- D. Door Louvers: Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.
  - 1. Sight-proof Louvers: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
  - 2. Lightproof Louvers: Stationary louvers constructed with baffles to prevent light from passing from one side to the other, any angle.
  - 3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible links and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by the same testing and inspecting agency that established fire-resistance rating of door assembly.
- E. Vision-Lite Systems: Manufacturer's standard kits consisting of glass-lite moldings to accommodate glass thickness and size of vision-lite indicated

## 2.4 FRAMES

- A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
- B. Frame minimum steel thickness:
  - 1. Interior – 18 gauge
  - 2. Exterior – 16 gauge (galvanized).
  - 3. Frames spaced 48" and wider – 14 gauge.
  - 4. Fire Rating Frames: Provide UL -label the same rating as indicated for the door.
- C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
- D. Plaster Guards: Provide 0.016-inch- (0.4-mm-) thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
- E. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) thick, electrolytic zinc-coated or metallic-coated steel sheet.
  - 1. Wall Anchors in Masonry Construction: 0.177-inch- (4.5-mm-) diameter, steel wire complying with ASTM A 510 (ASTM A 510M) may be used in place of steel sheet.
- F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.
- G. Provide ½" thick by 1-3/4" wide full height filler strip of styrofoam behind hinge jamb to allow for drilling and topping for continuous hinge in field.
- H. Grout-filled Frames and Door Frames:
  - 1. Where frames are indicated to be grouted or grout-filled, the inside of the frame must be installed with an asphaltic paint or an application of water-repellent sealer to prevent corrosive action to the steel frame.

## 2.5 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- (1.3-mm-) thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.
- C. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from the following material:
  - 1. Cold-rolled steel sheet, unless otherwise indicated.
  - 2. Metallic-coated steel sheet where indicated.

- D. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
1. Resin-impregnated kraft/paper honeycomb.
  2. Polyurethane.
  3. Polystyrene.
  4. Vertical steel stiffeners.
  5. Rigid mineral-fiber board.
- E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 1/4 inch (6.4 mm) at bottom to flooring or thresholds. Coordinate with other trades.
- F. Clearances for Fire-Rated Doors: As required by NFPA 80.
- G. Single-Acting, Door-Edge Profile: Beveled edge, unless square edge is indicated.
- H. Double-Acting, Door-Edge Profile: Round vertical edges with 2-1/8-inch (54-mm) radius.
- I. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- J. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- K. Exposed Fasteners: Provide countersunk flat or oval heads for exposed screws and bolts where acceptable by the Architect.
- L. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
1. Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.
- M. Sound-Rated (Acoustical) Assemblies: Where shown or scheduled, provide door and frame assemblies fabricated as sound-reducing type, tested according to ASTM E 1408, and classified according to ASTM E 413.
1. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 33 or greater.
- N. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
1. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.
- O. Frame Construction: Fabricate frames to shape shown.
1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.

2. For exterior applications, fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
  3. Provide welded frames with temporary spreader bars.
  4. Provide terminated stops where indicated.
- P. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- Q. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
- R. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.
1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
  2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.
- S. Astragals: As required by NFPA 80 to provide fire ratings indicated.

## 2.6 FINISHES

- A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.
- B. Factory-Applied Paint Finish: Manufacturer's standard, factory-applied paint finish complying with ANSI A250.3 for performance and acceptance criteria.
1. Finished paint coat will be field applied unless otherwise noted.
  2. Refer to drawing schedules for color and finish.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
  2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
  3. In existing concrete or masonry construction, provide at least three completed opening anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.



4. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
5. For existing gypsum board partitions, knock-down, drywall slip-on frames are acceptable.
6. Install fire-rated frames according to NFPA 80.
7. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
2. Smoke-Control Doors: Install to comply with NFPA 105.

### 3.2 ADJUSTING AND CLEANING

- A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08 1113

## SECTION 08 1416 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Solid-core wood doors with wood-veneer.
  - 2. Fire-rated solid wood doors.
  - 3. Factory finishing flush wood doors.
  - 4. Factory fitting flush wood doors to frames and factory machining for hardware.
  - 5. Glazing for flush wood doors .
  - 6. Door information is scheduled in the Drawings.
- B. Related Sections include the following:
  - 1. Division 08 7200 Section "Door Hardware" for hardware for wood doors and frames.
  - 2. Division 08 8000 Section "Glazing" for glass view panels in flush wood doors.
  - 3. Division 09 9100 Section "Painting" for factory finished doors.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of door.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and other pertinent data as follows:
  - 1. Dimensions and locations of mortises and holes for hardware.
  - 2. Dimensions and locations of cutouts for glass, louvers and other items.
  - 3. Requirements for veneer matching.
  - 4. Doors to be factory finished and finish requirements.
  - 5. Indicate fire ratings for fire doors.
  - 6. Indicate glazing type on wood doors.
- C. Samples for Verification:
  - 1. Manufacturer's standard factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI - "Architectural Woodwork Quality Standards Illustrated" or WDMA I.S.1-A, "Architectural Wood Flush Doors."
  - 1. Provide AWI Quality Certification Labels or a letter from WDMA certifying the of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
  - 1. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches (1000 mm) or less above the sill or Positive Pressure CAT –A.
  - 2. Locate UL labels on fire-rated doors at hinged side.
  - 3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 250 deg F (135 deg C) maximum in 30 minutes of fire exposure.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 3100 Section "Project Management and Coordination."

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package doors individually in plastic bags or cardboard cartons.
- B. Mark each door on top rail with opening number used on Shop Drawings.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship.
  - 1. Warranty shall also include installation and finishing.
  - 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
    - a. Solid-Core Exterior and Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products only from one of the listed manufacturers. Products from other manufacturers, not listed here-in will be required to submit a "Substitution Request" on the Architect's form located in Specification Section 01 6000
1. Flush Wood Doors (Solid):
    - a. Eggers Industries – Architectural Door Division.
    - b. Algoma Hardwoods.
    - c. Mohawk Flush Doors, Inc.
    - d. Oshkosh Architectural Door Co.
    - e. Marshfield Door Systems, Inc.
    - f. VT Industries.

### 2.2 DOOR CONSTRUCTION, GENERAL

- A. Adhesives: Do not use adhesives containing urea formaldehyde.
- B. Door Construction: Construct door framing with either structural composite lumber or staved solid wood lumber.
1. Internal Framing Lumber: Top, intermediate and bottom rails shall be at least 1-1/8 inch wide frame where doors will not receive door closers.
    - a. Provide at the top rail a 5-1/4 inch wide frame solid lumber to prevent thru-bolting of hardware closers.
    - b. Coordinate with Hardware schedules.
  2. Internal Framing Lumber: Top, intermediate and bottom rails and stiles shall be at least 5-1/4 inches wide of structural composite or solid lumber to prevent thru-bolting of door hardware closers and other door hardware items. Coordinate with Hardware schedules.
- C. Doors for Transparent Finish:
1. Grade: Grade A faces and veining without heartwood.
  2. Species and Cut: Red Oak, Plain Sliced.
  3. Match between Veneer Leaves: Slip match, unless otherwise indicated on Drawings.
  4. Assembly of Veneer Leaves on Door Faces: Running vein, unless otherwise indicated.
  5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
  6. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match where they are separated by 20 feet (6 m) or more.
  7. Transom Match: End match.
- D. Doors for Opaque Finish:
1. Grade: Economy.
  2. Faces for Exterior Doors: Any closed-grain hardwood of mill option.
  3. Faces for Interior Doors: Any closed-grain hardwood of mill option.
  4. Construct door framing with either structural composite lumber or glue-block.
    - a. Internal Framing Lumber: Top, bottom, intermediate rails and vertical stiles.

Refer to Door Construction specifications described in this Section.

- E. Door Sizes: Provide standard and custom door sizes and thickness as indicated or scheduled in the Drawings.

## 2.3 SOLID-CORE DOOR CONSTRUCTION

### A. Interior Veneer-Faced Doors:

1. Core: Either glued block or structural composite lumber.
2. Construction: Five plies with stiles and rails bonded to core, and entire unit abrasive planed before veneering.
3. Construction: Five plies, bonded construction.
4. Internal Framing Lumber: Top, bottom, intermediate rails and vertical stiles. Refer to Door Construction specifications described in this Section.

### B. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire-rating indicated.
2. Blocking: For mineral-core doors, provide structural composite lumber blocking with improved screw-holding capability for use in doors of fire ratings and indicated as follows:
  - a. 5-1/4-inch minimum top-rail blocking.
  - b. 5-1/4 inch minimum intermediate and mid-rail blocking.
  - c. 5-1/4-inch minimum bottom-rail blocking.
  - d. 5-1/4-inch minimum vertical stiles.
3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
5. Pairs: Furnish formed-steel edges and astragals with concealed intumescent seals for pairs of fire-rated doors.
  - a. Cover steel edges and astragals with same wood species color as door faces.
6. Pairs: Provide fire-rated pairs with fire-retardant stiles matching wood face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Provide fire-rated astragals matching wood veneer door faces.

## 2.4 WOOD LOUVERS AND VISION FRAMES

### A. Louvers and Vision Frames: Door manufacturer's standard solid-wood louvers, unless otherwise indicated.

1. Wood to match door wood species.
2. Louvers are not permitted in fire-rated doors.

## 2.5 FABRICATION

- A. Fabricate doors in sizes indicated for Project-site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
  - 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
  - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
  - 2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- D. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
  - 1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- E. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
  - 1. Light Openings: Provide manufacturer's standard trim openings with moldings, unless otherwise indicated on Drawings.
  - 2. Louvers: Factory install louvers in prepared openings.

## 2.6 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces and edges of doors, including cutouts, with one coat of wood primer specified in Division 09 Section "Painting."
- B. Doors for Transparent Finish: Shop seal faces and edge of doors, including cutouts, with stain (if required), other required pretreatments, and first coat of finish as specified in Division 09 Section "Wood Stains."

## 2.7 FACTORY FINISHING

- A. General: Comply with AWI "Architectural Woodwork Illustrated" or WDMA Architectural finishes.
- B. Opaque finished door: Install paint primer for field finished doors.
- C. Finish doors at factory that are indicated to receive finished stain or transparent finish.
- D. Finish doors at factory where indicated in schedules or on Drawings.

E. Transparent and Stained Finishes:

1. Grade: Premium.
2. Stain color – where indicated: Selected by the Architect.
3. Finish: Manufacturer's standard finish comparable to AWI System TR-6 catalyzed polyurethane or WDMA System TR-6 catalyzed polyurethane finish.
4. Effect: Manufacturer's standard filled finish.
5. Sheen: Satin (Low luster).

F. Opaque Finish:

1. Grade: Premium.
2. Finish: Manufacturer's standard finish with performance comparable to AWI System OP-2 catalyzed polyurethane.
3. Color: Match Architect's sample.
4. Sheen: Satin, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.
3. Reject doors that do not comply with the Architect's approved sample.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining. Correct wood frames not properly installed before proceeding with door installation.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 3/8 inch clearance from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.
  - a. Comply with NFPA 80 for fire-rated doors.
2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.

- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- F. Field-Finished Doors: Refer to the following for finishing requirements:
  - 1. Division 09 Section "Painting" for painting and wood staining.

### 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 1416



## SECTION 08 7200 – FINISH HARDWARE

### PART 1 - GENERAL

- 1.1 Refer to "General and Special Conditions", and "Instructions to Bidders", Division 1 of Specifications. Requirements of these Sections and the project drawings shall govern work in this section.
- 1.2 Work Included:
- A. Furnish all items of Finish Hardware specified, scheduled, shown or required herein except those items specifically excluded from this section of the specification.
  - B. Related work:
    - 1. Division 00 00 00 – Procurement and Contracting Requirements
    - 2. Division 01 00 00 – General Requirements
    - 3. Division 06 00 00 – Wood, Plastics, and Composites
    - 4. Division 08 00 00 – Openings
    - 5. Division 10 00 00 – Specialties
    - 6. Division 11 00 00 – Equipment
    - 7. Division 26 00 00 – Electrical
    - 8. Division 27 00 00 – Communications
    - 9. Division 28 00 00 – Electronic Safety and Security
  - C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:
    - 1. Cabinet Hardware.
    - 2. Signs, except as noted.
    - 3. Folding partitions, except cylinders where detailed.
    - 4. Sliding aluminum doors
    - 5. Chain link and wire mesh doors and gates
    - 6. Access doors and panels
    - 7. Overhead and Coiling doors
- 1.3 Quality Assurance
- A. Requirements of Regulatory Agencies:
    - 1. Furnish finish hardware to comply with the requirements of laws, codes, ordinances, and regulations of the governmental authorities having jurisdiction where such requirements exceed the requirements of the Specifications.
    - 2. Furnish finish hardware to comply with the requirements of the regulations for public building accommodations for physically handicapped persons of the governmental authority having jurisdiction and to comply with Americans with Disabilities Act.
    - 3. Provide hardware for fire-rated openings in compliance with NFPA 80 and state and local building code requirements. Provide only hardware that has been tested and listed by UL

for types and sizes of doors required and complies with requirements of door and door frame labels.

B. Hardware Supplier:

1. Shall be an established firm dealing in contract builders' hardware. He must have adequate inventory, qualified personnel on staff and be located within 100 miles of the project. The distributor must be a factory-authorized dealer for all materials required. The supplier shall be or have in employment an Architectural Hardware Consultant (AHC).

C. Electrified Door Hardware Supplier:

1. Shall be an experienced door hardware supplier who has completed projects with electrified door hardware 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, and who is acceptable to manufacturer of primary materials.
2. Shall prepare 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.
3. Shall have experience in providing consulting services for electrified door hardware installations.

D. Pre-installation Meeting:

1. Before hardware installation, General Contractor/Construction Manager will request a hardware installation meeting be conducted on the installation of hardware; specifically that of locksets, closers, exit devices, overhead stops and coordinators. Manufacturer's representatives of the above products, in conjunction with the hardware supplier for the project, shall conduct the meeting. Meeting to be held at job site and attended by installers of hardware for aluminum, hollow metal and wood doors. Meeting to address proper coordination and installation of hardware, per finish hardware schedule for this specific project, by using installation manuals, hardware schedule, templates, physical product samples and installation videos.
2. When any electrical or pneumatic hardware is specified this meeting shall also include the following trades/installers: Electrical, Security, Alarm systems and Architect.
3. Convene one week or more prior to commencing work of this Section.
4. The Hardware Supplier shall include the cost of this meeting in his proposal.

E. Manufacturer:

1. Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
2. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.

1.4 Submittals:

A. Hardware Schedule

1. Submit number of Hardware Schedules as directed in Division 1.
2. Follow guidelines established in Door & Hardware Institute Handbook (DHI) Sequence and Format for the Hardware Schedule unless noted otherwise.

3. Schedule will include the following:
  - a. Door Index including opening numbers and the assigned Finish Hardware set.
  - b. Preface sheet listing category only and manufacturer's names of items being furnished as follows:

CATEGORY	SPECIFIED	SCHEDULED
Hinges	Manufacturer A	Manufacturer B
Lock sets	Manufacturer X	Manufacturer X
Kick Plates	Open	Manufacturer Z

- c. Hardware Locations: Refer to Article 3.1 B.2 Locations.
- d. Opening Description: Single or pair, number, room locations, hand, active leaf, degree of swing, size, door material, frame material, and UL listing.
- e. Hardware Description: Quantity, category, product number, fasteners, and finish.
- f. Headings that refer to the specified Hardware Set Numbers.
- g. Scheduling Sequence shown in Hardware Sets.
- h. Product data of each hardware item, and shop drawings where required, for special conditions and specialty hardware.
- i. Electrified Hardware system operation description.
- j. "Vertical" scheduling format only. "Horizontal" schedules will be returned "Not Approved."
- k. Typed Copy.
- l. Double-Spacing.
- m. 8-1/2 x 11 inch sheets
- n. U.S. Standard Finish symbols or BHMA Finish symbols.

B. Product Data:

1. Submit, in booklet form Manufacturers Catalog cut sheets of scheduled hardware.
2. Submit product data with hardware schedule.

C. Samples:

1. Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample, if required, of each type of exposed hardware unit, finished as required and tagged with full description for coordination with schedule.
2. Samples will be returned to the supplier. Units, which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

D. Key Schedule:

1. Submit detailed schedule indicating clearly how the Owner's final keying instructions have been followed.
2. Submit as a separate schedule.

E. Electrified Hardware Drawings:

1. Submit elevation drawings showing relationship of all electrical hardware components to door and frame. Indicate number and gage of wires required.
  - a. Include wiring drawing showing point to point wire hook up for all components.
  - b. Include system operations descriptions for each type of opening; describe each possible condition.

- F. Submit to General Contractor/Construction Manager, the factory order acknowledgement numbers for the various hardware items to be used on the project. The factory order acknowledgement numbers shall help to facilitate and expedite any service that may be required on a particular hardware item. General Contractor/Construction Manager shall keep these order acknowledgement numbers on file in the construction trailer.

1.5 Product Delivery, Storage, and Handling:

- A. Label each item of hardware with the appropriate door number and Hardware Schedule heading number, and deliver to the installer so designated by the contractor.

1.6 Existing Conditions:

- A. **Where existing doors, frames and/or hardware are to remain, conditions, preparations and functions shall be field verified to confirm compatibility with specified hardware. Where any incompatibility is discovered, notify the contractor or construction manager immediately and provide a suggested solution based on industry standard business practices.**

1.7 Warranties:

- A. Refer to Division 1 for warranty requirements.
- B. Special Warranty Periods:
  - 1. Closers shall carry manufacturer's 30-year warranty against manufacturing defects and workmanship.
  - 2. Locksets shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
  - 3. Exit Devices shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
  - 4. Balance of items shall carry a manufacturer's 1-year warranty against manufacturing defects and workmanship.
- C. During the warranty period, replace defective work, including labor, materials and other costs incidental to the work.

PART 2 - PRODUCT

- 2.1 Furnish each category with the products of only one manufacturer unless specified otherwise; this requirement is mandatory whether various manufacturers are listed or not.
- 2.2 Provide the products of manufacturer designated or if more than one manufacturer is listed, the comparable product of one of the other manufacturers listed. Where only one manufacturer or product is listed, it is understood that this is the owner's Building Standard and "no substitution" is allowed.

A. Hinges:

1. Furnish hinges of class and size as listed in sets or as required to match existing conditions.
2. Numbers used are Ives (IVE).
3. Products of a BHMA member are acceptable.

B. Locksets and Latchsets - Mortise Type:

1. Locksets shall be manufactured from heavy gauge steel, minimum lockcase thickness 1/8", containing components of steel with a zinc dichromate plating for corrosion resistance.
2. Locks are to have a standard 2 3/4" backset with a full 3/4" throw two-piece stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.
3. Lockcase shall be easily handed without chassis disassembly by removing handing screw on lockcase and installing in opposite location on reverse side. Changing of door hand bevel from standard to reverse hand shall be done by removing the lockcase scalp plate, and pulling and rotating the latchbolt 180 degrees.
4. Lock trim shall be through-bolted to the door to assure correct alignment and proper operation. Lever trim shall have external spring cage mechanism to assist in support of the lever weight.
5. Function numbers are Schlage.
  - a. Schlage L9000
6. Lockset Trim:
  - a. Schlage 03B
7. Provide strikes with extended lips where required to protect trim from being marred by latch bolt. Provide strike lips that do not project more than 1/8" beyond door frame trim at single doors and have 7/8" lip to center at pairs of 1-3/4" doors.
8. Provide strikes as required to match existing conditions and preparations at existing openings.

C. Exit Devices:

1. Exit devices shall be touchpad style, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
2. All exit devices shall incorporate a fluid damper, which decelerates the touchpad on its return stroke and eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width. All latchbolts to be deadlatching type, with a self-lubricating coating to reduce wear.
3. End-cap will be sloped to deflect any impact from carts and they shall be flush with the external mechanism case. End caps that overlap and project above the mechanism case are unacceptable. End cap shall utilize a two-point attachment to the mounting bracket.
4. Touchpad shall match exit device finish, and shall be stainless steel for US26, US26D, US28, US32, and US32D finishes. Only compression springs will be used in devices, latches, and outside trims or controls.
5. Plastic templates shall be included with each exit device to facilitate a quick, easy and accurate installation.
6. Strikes shall be roller type and come complete with a locking plate to prevent movement.
7. All rim and vertical rod exit devices shall have passed a 5 million(5,000,000) cycle test based on ANSI A156.3, 1994, Grade 1 test standards and certified by an independent testing lab.
8. All mortise exit devices shall have passed a 10 million(10,000,000)cycle test based on ANSI A156.3, 1994, Grade 1 test standards and certified by an independent testing lab.
9. Provide cylinder dogging on panic exit hardware where noted in hardware sets.

10. Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be UL labeled fire exit hardware.
11. Lever trim for exit devices shall be vandal-resistant type, which will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
12. Von Duprin 99 Series. Series and function numbers as listed in sets.
13. Trim:
  - a. As specified in sets.
  - b. Levers to match lockset design where specified.

D. Electric Strike:

1. Electric strikes shall provide remote release of latchbolts. They shall be designed for use with the type locks shown at each opening where required. Strikes will be UL Listed for Burglary-Resistant Electric Door Strike, and where required, shall be UL listed as electric strikes for Fire Doors or Frames. Faceplates shall be stainless steel with finish as specified for each opening. The locking components shall be stainless steel to resist damage and abuse.
2. Solenoids shall be of the continuous duty type for the voltage specified. Plug connectors will be furnished. Strikes shall have an adjustable backbox to compensate for misalignment of door and frame.
3. Numbers used in sets are Von Duprin.
  - a. Von Duprin 6000 series

E. Closers:

1. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1 ½" in diameter, and double heat treated pinion shall be 11/16" in diameter with double D slab drive arm connection.
2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).
5. All surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory.
6. Closers will have Powder coating finish certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
7. Refer to door and frame details and furnish accessories such as drop plates, panel adapters, spacers and supports as required to correctly install door closers. State degree of door swing in the hardware schedule.
8. LCN Series as listed in sets.

F. Overhead Holders and Stops:

1. Type, function and fasteners must be same as Glynn-Johnson specified. Size per manufacturer's selector chart. Plastic end caps, hold open mechanisms and shock blocks are not allowed. End caps must be finished same as balance of unit.
2. Manufacture products using base material of Brass/Bronze for US3, US4, & US10B finished products and 300 Stainless Steel for US32 & US32D finished products.

3. Type, function, and fasteners must be the same as Glynn-Johnson specified. Size per manufacturer's selector chart.
  - a. Glynn-Johnson

G. Kick Plates:

1. Furnish .050 inches thick, beveled four sides, countersunk fasteners, 10" high x door width less 2" at single doors and less 1" at pairs. Where glass or louvers prevent this height, supply with height equal to height of bottom rail less 2".
2. Any BHMA manufacturing product meeting above is acceptable.

H. Wall Stops:

1. Length to exceed projection of all other hardware. Provide with threaded studs and expansion shields for masonry wall construction.
  - a. Ives WS447
  - b. BHMA L12011 or L12021

I. Miscellaneous:

1. Furnish items not categorized in the above descriptions but specified by manufacturer's names in Hardware Sets.

J. Fasteners:

1. Furnish fasteners of the proper type, size, quantity and finish. Use machine screws and expansion shields for attaching hardware to concrete or masonry, and wall grip inserts at hollow wall construction. Furnish machine screws for attachment to reinforced hollow metal doors and frames and reinforced aluminum doors and frames. Furnish full thread wood screws for attachment to solid wood doors and frames. "TEK" type screws are not acceptable.
2. **Sex bolts will not be permitted on reinforced metal doors or wood doors where blocking is specified.**

2.3 Finishes:

- A. Generally, Dull Chrome, US26D / BHMA 626. Provide finish for each item as indicated in sets.

2.4 Templates and Hardware Location:

- A. Furnish hardware made to template. Supply required templates and hardware locations to the door and frame manufacturers.
- B. Furnish metal template to frame/door supplier for continuous hinge.
- C. Refer to Article 3.1 B.2, Locations, and coordinate with templates.

2.5 Cylinders and Keying:

- A. All cylinders for this project will be supplied by one supplier regardless of door type and location.

- B. The Finish Hardware supplier will meet with Architect and/or Owner to finalize keying requirements and obtain keying instructions in writing.
  - 1. Supplier shall include the cost of this service in his proposal.
- C. Provide a cylinder for all hardware components capable of being locked.
- D. Provide cylinders master and grand master keyed to Schlage system according to Owner's instructions. Provide change keys, master keys and grand master keys as required by Owner.
- E. Provide cylinders with construction cores or keying for use during the construction period. When so directed, and in the presence of the Owner's security department or representative, convert construction cores or keying to the final system.
  - 1. Supplier shall include the cost of this service in his proposal.

### PART 3 - EXECUTION

#### 3.1 Installation

##### A. General:

- 1. Install hardware according to manufacturers installations and template dimensions. Attach all items of finish hardware to doors, frames, walls, etc. with fasteners furnished and required by the manufacture of the item.
- 2. Provide blocking/reinforcement for all wall mounted Hardware.
- 3. Reinforced hollow metal doors and frames and reinforced aluminum door and frames will be drilled and tapped for machine screws.
- 4. Solid wood doors and frames: full thread wood screws. Drill pilot holes before inserting screws.
- 5. Continuous gear hinges attached to hollow metal doors and frames and aluminum doors and frames: 12-24 x 1/2" #3 Phillips Keenform self-tapping. Use #13 or 3/16 drill for pilot.
- 6. Continuous Gear Hinges require continuous mortar guards of foam or cardboard 1/2" thick x frame height, applied with construction adhesive.
- 7. Install weather-strip gasket prior to parallel arm closer bracket, rim exit device or any stop mounted hardware. Gasket to provide a continuous seal around perimeter of door opening. Allow for gasket when installing finish hardware. Door closers will require special templating. Exit devices will require adjustment in backset.

##### B. Locations:

- 1. Dimensions are from finish floor to center line of items.
- 2. Include this list in Hardware Schedule.

##### CATEGORY

##### DIMENSION

Hinges  
Levers  
Exit Device Touchbar  
Wall Stops/holders

Door Manufacturer's Standard  
Door Manufacturer's Standard  
Per Template  
At Head

##### C. Field Quality Inspection:



1. Inspect material furnished, its installation and adjustment, and instruct the Owner's personnel in adjustment, care and maintenance of hardware.
2. Locksets and exit devices shall be inspected after installation and after the HVAC system is in operation and balanced, to insure correct installation and proper operation.
3. Closers shall be inspected and adjusted after the HVAC system is in operation and balanced, to insure correct installation and proper operation.
4. A written report stating compliance, and also locations and kinds of noncompliance shall be forwarded to the Architect with copies to the Contractor, hardware distributor, hardware installer and building owner.

D. Technical and Warranty Information:

1. At the completion of the project, the technical and warranty information coalesced and kept on file by the General Contractor/Construction Manager shall be given to the Owner or Owner's Agent. In addition to both the technical and warranty information, all factory order acknowledgement numbers supplied to the General Contractor/Construction Manager during the construction period shall be given to the Owner or Owner's Agent. The warranty information and factory order acknowledgement numbers shall serve to both expedite and properly execute any warranty work that may be required on the various hardware items supplied on the project.
2. Submit to General Contractor/Construction Manager, two copies each of parts and service manuals and two each of any special installation or adjustment tools. Include for locksets, exit devices, door closers and any electrical products.

3.2 Hardware Sets:

**Hardware Group No. 01**

EACH TO HAVE:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
		* EXISTING HDWE TO REMAIN *		

**Hardware Group No. 02**

EACH TO HAVE:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
2	EA PANIC HARDWARE	HDSI-9949-DT-LBL	626	VON
2	EA OH STOP	100S	630	GLY
2	EA SURFACE CLOSER	4021	689	LCN
2	EA MOUNTING PLATE	4020-18G	689	LCN
2	EA KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE

PANIC HARDWARE MAY BE 'DOGGED' (LATCHES HELD RETRACTED) FOR PUSH/PULL OPERATION.

**Hardware Group No. 03**

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	HDSI-9949-DT-LBL	626	VON
1	EA	PANIC HARDWARE	HDSI-9949-NL-LBL	626	VON
1	EA	RIM CYLINDER	20-022	626	SCH
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4021	689	LCN
2	EA	MOUNTING PLATE	4020-18G	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE

PANIC HARDWARE MAY BE 'DOGGED' (LATCHES HELD RETRACTED) FOR PUSH/PULL OPERATION.

**Hardware Group No. 04**

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	L9071P 03B L283-711	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4021	689	LCN
1	EA	MOUNTING PLATE	4020-18G	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

**Hardware Group No. 05**

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	ELECTRIC STRIKE	6400 FSE 12/24 VAC/VDC	↗ 630	VON
1	EA	ACCESS CONTROL	(PROVIDED BY SECURITY CONTRACTOR)	↗	
1	EA	DOOR CONTACT	679-05	↗ BLK	SCE
1	EA	MOTION SENSOR	SCANII 12/24 VDC (RE-USE BALANCE OF EXISTING HDWE)	↗ WHT	SCE

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT AND ALL RELATED TRADES.

**Hardware Group No. 06**

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050P 03B 09-544 L283-711	626	SCH
1	EA	OH STOP	90S	652	GLY
1	EA	GASKETING	488SBK PSA	BK	ZER

**Hardware Group No. 07**

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050P 03B 09-544	626	SCH
1	EA	WALL STOP	WS447	626	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

**Hardware Group No. 08**

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	REMOVABLE MULLION	KR4854B	689	VON
1	EA	PANIC HARDWARE	HDSI-99-DT	626	VON
1	EA	PANIC HARDWARE	HDSI-99-NL	626	VON
1	EA	MORTISE CYLINDER	20-001	626	SCH
1	EA	RIM CYLINDER	20-022	626	SCH
1	EA	ELECTRIC STRIKE	6300 FSE 12/24 VAC/VDC	↗ 630	VON
2	EA	OH STOP	90S	652	GLY
2	EA	SURFACE CLOSER	4021	689	LCN
2	EA	MOUNTING PLATE	4020-18G	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	ACCESS CONTROL	(PROVIDED BY SECURITY CONTRACTOR)	↗	

PRESENTING AN AUTHORIZED CREDENTIAL WILL ENERGIZE THE ELECTRIC STRIKE TO ALLOW ACCESS. FREE EGRESS IS ALWAYS ALLOWED.  
COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT AND ALL RELATED TRADES.  
PANIC HARDWARE MAY BE 'DOGGED' (LATCHES HELD RETRACTED) FOR PUSH/PULL OPERATION.

**Hardware Group No. 09**

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM SECURITY	L9071P 03B L283-711	626	SCH
1	EA	OH STOP	90S	652	GLY
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

**Hardware Group No. 10**

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080P 03B	626	SCH
1	EA	ELECTRIC STRIKE	6400 FSE 12/24 VAC/VDC	✓ 630	VON
1	EA	SURFACE CLOSER	4111 CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	ACCESS CONTROL	(PROVIDED BY SECURITY CONTRACTOR)	✓	
1	EA	DOOR CONTACT	679-05	✓ BLK	SCE
1	EA	MOTION SENSOR	SCANII 12/24 VDC	✓ WHT	SCE

PRESENTING AN AUTHORIZED CREDENTIAL WILL ENERGIZE THE ELECTRIC STRIKE TO ALLOW ACCESS. FREE EGRESS IS ALWAYS ALLOWED.

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT AND ALL RELATED TRADES.

**Hardware Group No. 11**

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050P 03B 09-544	626	SCH
1	EA	OH STOP	450S	652	GLY
1	EA	GASKETING	488SBK PSA	BK	ZER

END OF SECTION

Bldg	Door Numbers	HwSet#
DISC	100A	01
DISC	100B	01
DISC	100C	02
DISC	100D	03
DISC	101A	04
DISC	101B	05
DISC	101C	06
DISC	101D	01
DISC	103A	01
DISC	103B	01
DISC	104	07
DISC	105A	01
DISC	105B	07
DISC	106	07
DISC	107	01
DISC	108A	01
DISC	108B	01
DISC	112	01
DISC	113	01
DISC	114A	01
DISC	114B	01
DISC	115	01
DISC	116	01
DISC	118	01
DISC	120	01
DISC	121	01
DISC	122A	01
DISC	122B	01
KIDS	150A	01
KIDS	150B	01
KIDS	150C	08
KIDS	152A	09
KIDS	152B	10
KIDS	153A	11
KIDS	153B	01
KIDS	154	01

## SECTION 08 8000 – GLAZING (GLASS)

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified.
  - 1. Windows.
  - 2. Doors.
  - 3. Glazed entrance storefronts.
  - 4. Interior borrowed lites.
  - 5. Glass Types (Locations are indicated in the Drawings).
- B. Related Sections include the following:
  - 1. Division 07 2100 Section "Thermal Insulation" at curtain-wall spandrel areas.
  - 2. Division 07 8413 Section "Penetration Firestopping" at perimeter floor areas.
  - 3. Division 07 9200 Section "Joint Sealants".

#### 1.3 DEFINITIONS

- A. Glass Manufacturer: A firm that develops and produces glass from their factory.
- B. Glass Fabricator: A company that fabricates glass purchased from a Glass Manufacturer.
- C. Deterioration of Coated Glass: Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. Deterioration of Laminated Glass: Defects include edge separation, delamination materially obstructing vision through glass, and blemishes.
- E. Deterioration of Insulating Glass: Failure of the hermetic seal. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed, heat-treated or tempered) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
    - a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
    - b. Limit glass deflection to L/240 or flex use limit of glass, whichever is less, with full recovery of glazing materials.
    - c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
    - d. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 3/4 inch (19 mm), whichever is less.
      - 1) For monolithic-glass lites heat treated to resist wind loads.
      - 2) For insulating glass.
      - 3) For laminated-glass lites.
    - e. Minimum Glass Thickness for Exterior Lites: Not less than ¼ inch (6 mm).
    - f. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
  2. Safety and Fire-rated glass shall comply with CPSC – 16 CFR 1201 safety standards.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
  2. Glass Wind Load Design: 25 psf (1196 mm) minimum or higher to comply with exterior wall and roof design loads indicated. Comply with criteria of Governing Authorities and Agencies having jurisdiction.

## 1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass.
1. The name of the glass manufacturer and all technical data shall be included on the glass sample.
  2. The name of the glass fabricator or supplier shall be included on the glass sample.
  3. For each type of glass provided on the project. Refer to glazing glass types.
  4. For each color of exposed glazing sealant.

- C. Glazing Schedule: Use same designations indicated on Drawings or Specifications for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners.
- F. Product Data on Glass Types: Provide manufacturer's structural, physical and environmental characteristics, size limitations and installation requirements.
- G. SWRI Validation Certificate: For each elastomeric glazing sealant specified to be validated by SWRI's Sealant Validation Program.
- H. Warranties: Special warranties specified in this Section.

#### 1.6 QUALITY ASSURANCE

- A. Fabricator and Installer Qualifications: An experienced firm with at least five (5) years in business who has completed glazing similar in material, design, and extent to this Project; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program and acceptable to the glass manufacturer.
- B. Source Limitations for Glass Types: Obtain glass from one primary-glass manufacturer for each glass type listed.
- C. Adhesion and Compatibility Testing: Use manufacturer's standard test methods to determine whether priming and other specific preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
  - 1. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
- D. Glazing Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- E. Glazing Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- F. Safety Glazing Products: Comply with testing requirements of CPSC in 16 CFR 1201 and for CPSC CAT-1 and CPSC CAT-11.
  - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.



2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. (0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
  3. Glazing Requirements: Comply with all Rules and Standards for Safety Glazing of the current Michigan Construction Code and other agencies and authorities having jurisdiction.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below.
1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
  2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
  3. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."
- H. Mockups (In-place): Before glazing, build mockups for each glass product indicated below to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Construct mockups in the exterior building wall at the location and size indicated as directed by Architect.
  2. Build mockups with the following kinds of glass to match glazing systems required for Project, including typical lite size, framing systems, and glazing methods for Architect's review before proceeding with general installation:
    - a. Insulated and spandrel glass.
  3. Obtain Architect's acceptance of mockups before proceeding with construction.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 3100 Section "Project Management and Coordination."
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
  - B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.
- 1.8 PROJECT 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 liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

## 1.9 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty on Coated-Glass Products: Written Warranty, made out to Owner and signed by coated-glass manufacturer agreeing to remove existing and furnish and install replacements for those coated-glass units that are deteriorated.
  1. Warranty Period: ten (10) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Laminated and Tempered Glass: Written warranty, made out to Owner and signed by glass manufacturer agreeing to remove existing and furnish and install replacements for glass units that deteriorate as defined in "Definitions" Article.
  1. Warranty Period: Ten (10) years from date of Substantial Completion.
- D. Manufacturer's Special Warranty on Insulating Glass: Written Warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to remove existing and furnish and install replacements for insulating-glass units that deteriorate as defined in "Definitions" Article.
  1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Glass Manufacturers – General
  1. Obtain materials from only one manufacturer or fabricator for each type; obtain tinted primary glass (if any) used for each type from only one manufacturer.
  2. Where manufacturer's product names are indicated, only comparable products of the manufacturers listed as the Basis of Design will be considered.
- B. Glass Manufacturers
  1. Glass Products: The following listed glass manufacturers, provided they comply with the requirements of the contract documents, will be among the firms considered acceptable: Substitutions of other non-listed glass manufacturers will not be permitted.
    - a. AFG Industries
    - b. Guardian Industries
    - c. PPG Industries, Inc.
    - d. Pilkington
    - e. Visteon
    - f. Vetrotech Saint-Gobain
    - g. Cardinal Industries Corp.
    - h. Paragon Architectural Products.
    - i. AGC Glass Company

C. Glass Fabricators

1. Obtain materials from only one manufacturer or fabricator for each type; obtain tinted primary glass (if any) used for each type from only one manufacturer.
2. Where manufacturer's product names are indicated, comparable products of the glass manufacturers listed as the Basis of Design will be considered.
  - a. Guardian Industries, North America.
  - b. Oldcastle Glass Group
  - c. Pilkington North America, Inc.
  - d. PPG Industries, Inc.
  - e. SAFTI, a division of O'Keeffe's Inc.
  - f. Viracon
  - g. Saint-Gobain, North America
  - h. Other glass fabricators in continuous business at least ten (10) years. Submit "Substitution Request" on form located in Specification Division 01 6000 Section "Product Requirements" to the Architect for evaluation.

D. Glass types: General Information

1. Not all glass types indicated here-in will be used on the project. Refer to the Drawings for applicable glass types to be provided.
2. Provide glass to comply with Building Codes and other Authorities and Agencies having jurisdiction.
3. Notify Architect of any conflicts. Glass fire-ratings shall be the same fire-rating as for the door or wall partitions indicated on the Drawings.
4. Glass Type for Skylights: Glass criteria and data is indicated in the Specification Sections 08 6300 "Metal-Framed Skylights."

E. GLASS TYPES

- GL-1 ¼ inch thick CLEAR Annealed (AF) Glass  
Annealed Float glass
- GL-2 ¼ inch thick TINTED Heat Strengthened (HS) Glass  
Heat Strengthened Float glass
- GL-3 ¼ inch thick CLEAR Tempered (FT) Glass  
Fully-Tempered glass – Safety glass
- GL-4 ¼ inch thick TINTED Tempered (FT) – Bronze (green, etc.)  
Fully-Tempered – Safety glass
- GL-5 SERIES GLASS TYPES
- a. Glass must meet requirements of Category CPSC-1 and CPSC 16CFR 1201 Category-II, for high-level impact safety requirements and any additional requirements complying with the current Michigan Building Codes and/or International Building Codes and other Authorities and Agencies having jurisdiction.
- GL-5a 1/4 inch thick – CLEAR non-wire glass type in hollow metal frames.  
20 minute fire-rated requirement – vision glass at doors only.

- a. Basis-of-Design: ¼ inch clear glass; Pyroswiss Extra, as manufactured by Vetrotect Saint-Gobain.
  - b. Contractor's Option: Contractor may provide a safety laminated-wire-glass complying with required fire-ratings, and CPSC Category-1 and CPSC 16CFR 1201 Category II, for high-level impact criteria and acceptable to Authorities and other Authorities and Agencies having jurisdiction.
- GL-5b 1/4 inch thick - CLEAR plastic type glass.  
90 minutes fire-rated doors only – maximum 100 sq in. vision glass area.
- a. Basis-of-Design: ¼ inch clear glass; Keralite – FRF, as manufactured by Vetrotect Saint-Gobain.
  - b. Contractor's Option: ¼ inch thick – laminated clear wire glass.  
90 minutes fire-rated doors only – maximum 100 sq. in., vision glass area.  
"Superlite 1W" or approved equal.
- GL-5c ¾ inch thick – CLEAR Glass  
45 minute fire-rated requirement – doors, sidelites, transoms, walls in hollow metal frames.
- a. Basis-of-Design: ¾ inch CLEAR glass; Swissflam, as manufactured by Vetrotect Saint-Gobain.
  - b. Contractor's Option: ¾ " thick clear glass: " Superlite II XL " or approved equal.
- GL-5d 1-1/8 inch thick – CLEAR Glass  
60 minute fire-rated requirement – doors, sidelites, walls in hollow metal frames.
- a. Basis-of-Design: 1-1/8" thick CLEAR glass; " Swissflam, "as manufactured by Vetrotect Saint-Gobain.
  - b. Contractor's Option: 1-1/8 " thick - clear glass: "Superlite II XL " or approved equal.
- GL-5e 1-1/2 inch thick – CLEAR Glass.  
90 minute fire-rated requirement – doors, sidelites, walls in hollow metal frames.
- a. Basis-of-Design: 1-1/2 inch thick clear glass; " Swissflam-90,"  
by Vetrotect Saint-Gobain. maximum contained size - 22 sq. ft.)
- GL-6 ¼ inch total thickness – CLEAR Laminated Safety Glass  
Two (2) 1/8" Annealed Float glass panes  
with PVB interlayer between panes
- GL-7 One-way MIRROR Glass; ¼ inch thick – Grey  
Transparent Coating ( on Subject side )  
Visible Transmittance – 12 %  
Visible Reflectance – 60 %  
Manufacturer: "Pilkington Mirropane E.P.", Transparent Mirror
- GL-8 School Guard Glass 1-844-744-5277  
SG4

Basis-of-Design Product: SG4 by School Guard Glass as manufactured by Laminated Technologies Inc. (844) 744-5277 or equal.

- a. Security glazing shall have the following characteristics
- i. No more than  $\frac{3}{8}$ " nominal thickness
  - ii. No more than 4.60 lbs. per square foot
  - iii. 5-aa1 rated up to 12 minutes
  - iv. Glass clad on interior and exterior surfaces
  - v. Optical Haze to be no more than 1.8%
  - vi. Blast rating shall be:
    1. 4 psi/28 psi-msec for pieces up to 48 "x 96"
    2. 10 psi/89 psi-msec for pieces up to 24 "x 48"
    3. Rating dependent on conforming framing
- GL-11 Solarban 60 on Optigray + Clear manufactured by PPG-Vitro Architectural Glass  
Indoor and Outdoor lite to be heat strengthened  
Indoor lite: Clear 6mm  
Outdoor Lite: 6mm Optigray with a second surface Solarban 60  
Low e Coating: Solarban 60 on surface #2  
Interspace: 1/2" 100% Air  
Performance Values: Visible Light Transmission - 50 percent; SHGC - 0.30;  
Shading Coefficient - 0.35; Outdoor Visible Light Reflectance - 8 percent.  
Heat Transfer Coefficient:100% Air U-Value Winter- 0.29, U-Value Summer -0.27  
PPG - Vitro Architectural Glass Approved Manufacturers/Where to Buy PPG  
Products: PPG-Vitro Architectural Glass Certified Network (CFP, CLP, CCWF)  
Certification: PPG lite(s) are Cradle to Cradle certified by McDonough Braungart  
Design Chemistry, LLC (MBDC [www.mbdc.com](http://www.mbdc.com))
- GL-14 Solarban 60 on Optigray + Clear manufactured by PPG-Vitro Architectural Glass  
Tempered unit  
Indoor and Outdoor lite to be heat strengthened  
Indoor lite: Clear 6mm  
Outdoor Lite: 6mm Optigray with a second surface Solarban 60  
Low e Coating: Solarban 60 on surface #2  
Interspace: 1/2" 100% Air  
Performance Values: Visible Light Transmission - 50 percent; SHGC - 0.30;  
Shading Coefficient - 0.35; Outdoor Visible Light Reflectance - 8 percent.  
Heat Transfer Coefficient:100% Air U-Value Winter- 0.29, U-Value Summer -0.27  
PPG - Vitro Architectural Glass Approved Manufacturers/Where to Buy PPG  
Products: PPG-Vitro Architectural Glass Certified Network (CFP, CLP, CCWF)  
Certification: PPG lite(s) are Cradle to Cradle certified by McDonough Braungart  
Design Chemistry, LLC (MBDC [www.mbdc.com](http://www.mbdc.com))
- GL-21 1" Insulated Composite Laminated Aluminum Spandrel Sandwich Panels  
Exterior face sheet: Thickness = 0.24 smooth surface  
Color: Match Architect's special "Kynar 500" color sample  
  
Core Construction: 1" Polyisocyanurate insulation.  
Interior face sheet: Thickness – 0.24 smooth surface  
Color: Match Architect's special "Kynar 500" color sample  
  
Composite panel detail must fit into window frame glazing pocket with water-tight  
gasket seals.  
R-Value: R = 6.0 minimum

NOTE: The Glass Contractor shall provide and install the spandrel panels as part their integral responsibility.

1. Manufacturer's Product – Basis-of Design: Laminators Inc. Water Resistant Thermolite panel: \*\* Laminators Inc. (743-777-6788).
2. Citadel Architectural, GlazeGuard 1000 WR. \*\* Statre Corp. (248-307-0800).
3. Copper Sales, Inc. – UNA.CORE Panel Units as specified and detailed.
4. Other Manufacturers complying to criteria and acceptable to the Architect.

## 2.2 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will 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.
  1. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of custom and special colors.
- B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

## 2.3 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers, and complying with ASTM C 1281 and AAMA 800.
- B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 1, for glazing applications in which tape acts as the primary sealant.
  2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.4 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
1. Neoprene, ASTM C 864.
  2. EPDM, ASTM C 864.
  3. Silicone, ASTM C 1115.
  4. Thermoplastic polyolefin rubber, ASTM C 1115.

- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
  - 1. Neoprene.
  - 2. EPDM.
  - 3. Silicone.
  - 3. Thermoplastic polyolefin rubber.

## 2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. 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.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing 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. Effective sealing between joints of glass-framing members.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials.

- B. Glazing channel dimensions, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove imperfections and damaged glass from Project site and legally dispose of off Project site.
- D. Apply primers to joint surfaces where required for adhesion of sealants.
- E. 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.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass-lites where the length plus width is larger than 50 inches (1270 mm) as follows:
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where needed to prevent glass-lites from moving sideways in glazing channel.
- I. 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.
- J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these 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. Apply cap bead of elastomeric sealant over exposed edge of tape.



### 3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance 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. Compress gaskets to produce a weather-tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. Remove them immediately as recommended by glass manufacturer.
- C. Promptly remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism.
- D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08 8000

## SECTION 09 2900 - GYPSUM BOARD

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes, but not limited to coordination of metal stud spacing for curved wall and other partition types and the following:
  - 1. Steel suspended ceiling and soffit framing.
  - 2. Steel partition framing.
  - 3. Interior gypsum wallboard.
  - 4. Exterior gypsum board panels for ceilings and soffits.
  - 5. Tile backing panels.
  - 6. Trim accessories.
  - 7. Joint Sealants.
- B. Related Sections include the following:
  - 1. Division 05 4000 Section "Cold-Formed Metal Framing" for load-bearing steel framing.
  - 2. Division 06 1000 Section "Rough Carpentry" for wood framing and furring.
  - 3. Division 07 2100 Section "Thermal Insulation" for insulation and vapor retarders installed in gypsum board assemblies.
  - 4. Division 07 8413 Section "Penetration Fire-Stopping and Smoke System."
  - 5. Division 09 3000 Section "Tiling" for cementitious backer units installed as substrates for ceramic type tile materials.
  - 6. Division 09 9100 Section "Painting" for primers applied to gypsum board surfaces.

#### 1.3 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

## 1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products", UL's "Fire Resistance Directory", GA-600, "Fire Resistance Design Manual."
- B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
  - 1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."
- C. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and qualities of materials and execution.
  - 1. Install mockups for surfaces with texture finishes.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Steel Framing and Furring:
    - a. Clark Steel Framing Systems.
    - b. Dale Industries, Inc. - Dale/Incor.
    - c. Dietrich Industries, Inc.
    - d. Unimast, Inc.
    - e. Western Metal Lath & Steel Framing Systems.

2. Gypsum Board and Related Products:
  - a. American Gypsum Co.
  - b. G-P Gypsum Corp.
  - c. Lafarge North America Inc.
  - d. National Gypsum Company.
  - e. United States Gypsum Co. (USG Corp.)

## 2.2 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Components, General: Comply with ASTM C 754 for conditions indicated.
- B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- C. Hanger Attachments to Concrete:
  1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to five (5) times that imposed by construction as determined by testing according to ASTM E 488.
  2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to ten (10) times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.
- D. Hangers: As follows:
  1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, minimum 0.162-inch (4.12-mm) diameter.
  2. Rod Hangers: ASTM A 510 (ASTM A 510M), galvanized mild carbon steel.
  3. Flat Hangers: Commercial-steel sheet, ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized or ASTM A 366/A 366M, with corrosion-resistant paint finish.
  4. Angle Hangers: ASTM A 653/A 653M, [G60 (Z180)], hot-dip galvanized commercial-steel sheet, sized to structurally support materials.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch (1.37 mm), a minimum 1/2-inch- (12.7-mm-) wide flange, with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized manufacturer's standard corrosion-resistant zinc coating.
  1. Depth: 2-1/2 inches (63.5 mm) unless otherwise indicated.
- F. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized manufacturer's standard corrosion-resistant zinc coating.
  1. Cold Rolled Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, 3/4 inch (19.1 mm) deep.
  2. Steel Studs: ASTM C 645.
    - a. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
    - b. Depth: 3-5/8 inches (92.1 mm) unless otherwise indicated.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.
    - a. Interior Locations - Minimum Base Metal Thickness: 0.0312 inch (0.79 mm) unless otherwise indicated.
    - b. Exterior Locations: Install 18 ga. Minimum light-gauge metal stud type and bracings not more than 4'-0" apart to resist 25 lbs./sf for wind up-lift.
  4. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep members designed to reduce sound transmission.
- G. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
    - b. Chicago Metallic Corporation; Fire Front 630 Drywall Furring 640 System.
    - c. USG Interiors, Inc.; Drywall Suspension System.

### 2.3 STEEL PARTITION FRAMING

- A. Components, General: Refer to Section 05 4000 "Cold-Formed Metal Framing" and as follows:
1. Comply with ASTM C 754 for conditions indicated.
  2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized manufacturer's standard corrosion-resistant zinc coating.
- B. Steel Studs and Runners: ASTM C 645.
1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
  2. Depth: 3-5/8 inches (92.1 mm) unless otherwise indicated.
  3. Exterior Locations: 18 gauge Minimum light gauge steel studs.
- C. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges.
- D. Proprietary Deflection Track for Non-Rated Partitions: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.
1. Product: Subject to compliance with requirements, provide one of the following:
    - a. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
    - b. Metal-Lite, Inc.; Slotted Track.
- E. Proprietary Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Product: Subject to compliance with requirements, provide one of the following:
    - a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
    - b. Metal-Lite, Inc.; The System.

- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
  - 1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm) unless otherwise required.
- G. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange.
  - 1. Depth: 1-1/2 inches (38.1 mm) minimum.
  - 2. Clip Angle: 1-1/2 by 1-1/2 inch (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
  - 1. Interior Locations: Minimum Base Metal Thickness: 0.0312 inch (0.79 mm) at interior locations and 0.0428 at exterior locations.
  - 2. Depth: 7/8 inch (22.2 mm) unless otherwise indicated.
  - 3. Exterior Locations: 18 gauge Minimum light gauge steel studs.
- I. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.
- J. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange.
  - 1. Depth: 3/4 inch (19.1 mm) minimum.
  - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
  - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.
- L. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- M. Install horizontal bracing at 8'-0" on center maximum vertical spacing along entire height of partitions type forming construction.

## 2.4 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
  - 1. Joint Locations: Provide joints at transitions, at one side of openings and at not more than 30 feet along walls and ceilings and elsewhere, where indicated on Drawings. Coordinate and review with the Architect. Provide joint accessories.
- B. Gypsum Wallboard.
  - 1. All interior drywall to be High-Impact Type Wallboard: ASTM C 36, manufactured with Type X core, plastic film to backside for greater resistance to through-penetration (impact resistance).
  - 2. 5/8 inch (15.9 mm), High-impact Type X.
  - 3. Long Edges: Tapered.

4. Curved Partitions: Adhere and mechanically fasten in layers to total partition thickness indicated. Coordinate metal stud spacing to 6 – 12 inches on-center to suit minimum radius of widthwise bent board of 40 foot curve.
  5. Manufacturer's Product: National Gypsum Company; Gold Bond Hi-Impact XP.
    - a. Other manufacturer's equal product acceptable to the Architect.
- C. Fire-Rated Gypsum Wallboard Partition Assemblies (Note: The UL Design Numbers are noted for reference, other "UL HW D" Design Systems may be installed to suit fire-ratings.)
1. Metal Stud Gypsum Wallboard Partitions: UL Design No. U-400 Series.
    - a. One (1) Hour Rating: UL Design No. U-404.
      - 1) Nonbearing partitions with total thickness as indicated on Drawings.
    - b. Two (2) Hour Rating: UL Design No. U-425.
      - 1) Nonbearing partitions with total thickness as indicated on Drawings.
- D. Accessories and Fasteners: Provide manufacturer's standard fasteners and accessories as required for installation, maintaining same lead equivalence as rest of system.

## 2.5 EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
1. Joint Locations: Provide joints at transitions, at one side of openings and at not more than 15 feet along walls and ceilings and elsewhere, where indicated on Drawings. Coordinate and review with the Architect. Provide joint accessories.
- B. Exterior Gypsum Soffit Board: ASTM C 931/C 931M, with manufacturer's standard edges.
1. Core: As indicated, 1/2 inch (12.7 mm), regular type and 5/8 inch (15.9 mm), Type X.
- C. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.
1. Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to, "Dens-Glass Gold" by G-P Gypsum Corp.
  2. Core: As indicated, 1/2 inch (12.7 mm), regular type and 5/8 inch (15.9 mm), Type X.

## 2.6 TILE BACKING PANELS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M.
1. Core: 5/8 inch (15.9 mm), Type X.
- C. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M.

1. Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, "Dens-Shield Tile Backer" manufactured by G-P Gypsum Corp.
2. Core: 5/8 inch (15.9 mm), Type X.

D. Cementitious Backer Units: ANSI A118.9.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Custom Building Products; Wonderboard.
  - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
  - c. United States Gypsum Co.; DUROCK Cement Board.
  - d. National Gypsum Company; PermaBase Cement Board
2. Thickness: As indicated.

2.7 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:
  - a. Cornerbead: Use at outside corners.
  - b. Bullnose Bead: Use where indicated.
  - c. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
  - d. L-Bead: L-shaped; exposed long leg receives joint compound; use where required.
  - e. U-Bead: J-shaped; exposed short flange does not receive joint compound; use at exposed panel edges.
  - f. Expansion (Control) Joint: Use where indicated and required.
  - g. Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet or rolled zinc.
2. Shapes:
  - a. Cornerbead: Use at outside corners.
  - b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
  - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening. Use where indicated and required.
  - d. Expansion Joint Unit: Install where indicated.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Fry Reglet Corp.
  - b. Gordon, Inc.



- c. MM Systems Corporation.
  - d. Pittcon Industries.
- 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), alloy 6063-T5.
  - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified or Class II anodic finishes and factory-painted, baked-enamel finishes.

## 2.8 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
  - 1. Interior Gypsum Wallboard: Paper.
  - 2. Exterior Gypsum Soffit Board: Paper.
  - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
  - 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
  - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
  - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
  - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Joint Compound for Exterior Applications:
  - 1. Exterior Gypsum Soffit Board: Use setting-type taping and setting-type, sandable topping compounds.
  - 2. Glass-Mat Gypsum Sheathing Board: As recommended by manufacturer.
- E. Joint Compound for Tile Backing Panels:
  - 1. Water-Resistant Gypsum Backing Board: Use setting-type taping and setting-type, sandable topping compounds.
  - 2. Glass-Mat, Water-Resistant Backing Panel: As recommended by manufacturer.
  - 3. Cementitious Backer Units: As recommended by manufacturer.

## 2.9 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Isolation Strip at Exterior Walls:
1. Asphalt-Saturated Organic Felt: ASTM D 226, 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 (3.2 mm) thick, in width to suit steel stud size.
- E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- G. Polyethylene Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."
- H. Fire-Safing Insulation: As specified in Division 07 Section "Thermal Insulation." For fire-rated partitions.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

#### 3.2 PREPARATION

- A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
  2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive

material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

### 3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or with United States Gypsum's "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
  - 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
  - 2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
    - a. Use deep-leg deflection track.
    - b. Use proprietary deflection track.
    - c. Use proprietary firestop track.
- D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

### 3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Suspend ceiling hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
  - 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
  - 4. Secure rod flat angle hangers to structure, including intermediate framing members, by attaching to inserts, eye-screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

6. Do not attach hangers to steel deck tabs.
  7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.
- C. Sway-brace suspended steel framing with hangers used for support.
- D. For exterior soffits, install cross bracing and framing to resist wind uplift.
- E. Screw furring to wood framing.
- F. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.
- G. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
1. Hangers: 48 inches (1219 mm) o.c.
  2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
  3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
- H. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

### 3.5 INSTALLING STEEL PARTITION

- A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
1. Where studs are installed directly against exterior walls, install asphalt-felt or foam-gasket isolation strip between studs and wall.
- B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
  2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
- D. Install steel studs and furring at the following spacings:
1. Single-Layer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.

2. Multilayer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.
  3. Cementitious Backer Units: 16 inches (406 mm) o.c., unless otherwise indicated.
- E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.
- F. Curved Partitions:
1. Cut top and bottom track (runners) through leg and web at 2-inch (50-mm) intervals for arc length. In cutting lengths of track, allow for uncut straight lengths of not less than 12 inches (300 mm) at ends of arcs.
  2. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
  3. Support outside (cut) leg of track by clinching steel sheet strip, 1-inch- (25-mm-) high-by-thickness of track metal, to inside of cut legs using metal lock fasteners.
  4. Begin and end each arc with a stud, and space intermediate studs equally along arcs at stud spacing recommended in writing by gypsum board manufacturer for radii indicated. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches (150 mm) o.c.
- G. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
1. Install two studs at each jamb.
  2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint.
  3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- H. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- I. Z-Furring Members:
1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.
  2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (600 mm) o.c.
  3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.
  4. Until gypsum board is installed, hold insulation in place with 10-inch (250-mm) staples fabricated from 0.0625-inch- (1.59-mm-) diameter, tie wire and inserted through slot in web of member.
- J. Vapor Retarder: Install to comply with requirements specified in Division 07 Section" Thermal Insulation."

### 3.6 APPLYING AND FINISHING PANELS, GENERAL

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- E. 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.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members using resilient channels, or provide control joints to counteract wood shrinkage.
- I. Control Joints and Expansion Joints: Install control and expansion joints at locations indicated on Drawings and according to ASTM C 840 and in locations acceptable to the Architect and to maintain fire-resistance rating of the assemblies and with space between edges of adjoining gypsum panels.
- J. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Fit gypsum panels around ducts, pipes, and conduits.
  - 2. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- K. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- L. Floating Construction: Install gypsum panels over wood framing, with floating internal corner construction.
- M. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion 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 C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

- N. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
- O. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

### 3.7 PANEL APPLICATION METHODS

#### A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
  - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
  - b. At stairwells and other high walls, install panels horizontally, unless otherwise required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

#### B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

#### C. Multilayer Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

#### D. Laminating to Substrate: Where gypsum panels are directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

#### E. Curved Partitions:

1. Install panels horizontally and unbroken, to the extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
2. Wet gypsum panels on surfaces that will become compressed where curve radius prevents using dry panels. Comply with gypsum board manufacturer's written recommendations for curve radii, wetting methods, stacking panels after wetting, and other preparations that precede installing wetted gypsum panels.
3. On convex sides of partitions, begin installation at one end of curved surface and fasten gypsum panels to studs as they are wrapped around curve. On concave side, start fastening panels to stud at center of curve and work outward to panel ends. Fasten panels to framing with screws spaced 12 inches (300 mm) o.c.
4. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.
5. Allow wetted gypsum panels to dry before applying joint treatment.

- F. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered and located over supports.
  - 1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
  - 2. Fasten with corrosion-resistant screws.
  
- G. Tile Backing Panels:
  - 1. Water-Resistant Gypsum Backing Board: Install at showers, tubs, and where indicated. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
  - 2. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at showers, tubs, and locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
  - 3. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and locations indicated to receive tile.
  - 4. Areas Not Subject to Wetting: Install standard gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.
  - 5. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
  
- B. Control Joints: Install control joints at locations indicated on Drawings, install control joints according to ASTM C 840 and in specific locations approved by Architect.

### 3.9 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
  
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
  
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
  
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
  - 1. Level-1: Above finished ceilings concealed from view, ceiling plenum areas, and where indicated. Embed tape in joint compound, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies. Joint sanding not required.
  - 2. Level-2: Areas that form substrate for Ceramic Tile or other hard surface materials. Embed tape in joint compound and apply separate first coat of joint compound to tape, fasteners, and trim flanges. Sand joints to substrate tolerances.



3. Level-3: Areas that form substrate for Wall Coverings or other flexible surface materials. Embed tape in joint compound and apply separate first coat of joint compound to tape, fasteners, and trim flanges. Sand smooth joints for flat transition.
  4. Level-4: Walls and Ceilings for Painting. Embed tape in joint compound and sand joints. Apply a separate finish coat of joint compound to tape, fasteners, and trim flanges. Sand joints and fastener areas for a smooth flat transition.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
- G. Cementitious Backer Units: Finish according to manufacturer's written instructions.
- 3.10 FIELD QUALITY CONTROL
- A. Above-Ceiling Observation: General Contractor will conduct an above-ceiling observation and report deficiencies in the Work observed. Proceed with installation of gypsum board to ceiling support framing after deficiencies have been corrected.
1. Notify all Contractors seven (7) calendar days in advance of date and time when Project, will be ready for above-ceiling observation.

END OF SECTION 09 2900

## SECTION 09 5123 - ACOUSTICAL TILE 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. This Section includes acoustical tiles for ceilings and the following:
  - 1. Exposed suspension systems.
  - 2. Concealed suspension systems.
  - 3. Direct attachment of tiles to substrates with adhesive.
  - 4. Trim and Accessories
  - 5. Acoustic ceiling tile types: For information, refer to schedules located on Drawings.
- B. Related Sections include the following:
  - 1. Division 21 Section "Mechanical" for HVAC Suppression Systems.
  - 2. Division 23 Section "Mechanical" for HVAC Systems.
  - 3. Division 26 Section "Electrical " for Lighting.
- C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling suspension assembly members.
  - 2. Method of attaching hangers to building structure.
    - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
  - 3. Size and location of initial access modules for acoustical tile.
  - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Tile: Set of full-size Samples of each type, color, pattern, and texture.
  2. Suspension System Members: 12-inch- (300-mm-) long Sample of each type.
  3. Exposed Moldings and Trim: Set of 12-inch- (300-mm-) long Samples of each type and color.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical tile ceiling.
- E. Research/Evaluation Reports: For acoustical tile ceiling and components and anchor type.
- F. Maintenance Data: For finishes to include in maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:
1. Fire-Resistance Characteristics: Where indicated, provide acoustical tile ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
    - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
  2. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E 1264 for Class-A materials as determined by testing identical products per ASTM E 84:
    - a. Smoke-Developed Index: 450 or less.
    - b. Maximum Flame Spread: 25
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 3100 Section "Project Management and Coordination."

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages 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.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, 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.

## 1.7 COORDINATION

- A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Within each space to receive specified products, do not begin installation until the following conditions are met:
  - 1. Work above ceilings has been finished, tested, and approved.
  - 2. Space to receive ceiling system is properly enclosed and protected from weather.
  - 3. Any wet work within the space is dry.

## 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of quantity installed.
  - 2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2.0 percent of quantity installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
- B. Manufacturers as indicated on the Drawings and as listed below.
  - 1. Armstrong World Industries, Inc.
  - 2. Celotex Corp. (The)
  - 3. Chicago Metallic Corp.
  - 4. Metal Building Interior Products Co.
  - 5. USG Interiors, Inc.
- C. Acoustic Tile Types – Material Information and Selection.
  - 1. Refer to informational schedules located in the Architect's Drawings.

### 2.2 ACOUSTICAL TILES, GENERAL

- A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances.
- B. Coating-Based Antimicrobial Treatment: Provide acoustical tiles with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with

fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273.

- C. Tile-Based Antimicrobial Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial solution that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria.

## 2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
  - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung."
  - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512.
    - a. Type: Cast-in-place anchors.
    - b. Type: Postinstalled expansion anchors.
    - c. Type: Postinstalled adhesive anchors.
    - d. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
    - e. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 alloy 304 or 316 for bolts; alloy 304 or 316 for anchors.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung").
- E. Hanger Rods or Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

## 2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING

- A. Manufacturer's Products:

1. Exposed or Concealed ceiling system compatible with the acoustic tile indicated.
  2. Refer to information scheduled in the Drawings.
- B. Direct-Hung, Double-Web Fire-Rated Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytic zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 (Z90) coating designation.
1. Structural Classification: Intermediate duty system.
- C. Indirect-Hung Fire-Rated Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytic zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 (Z90) coating designation.
1. Structural Classification: Intermediate duty system.
  2. Carrying Channels: Cold-rolled steel, 0.059850-inch- (1.52-mm-) minimum base (uncoated) metal thickness, not less than 3/16-inch- (4.7-mm-) wide flanges by 1-1/2-inch- (38-mm-) deep steel channels, 475 lb/1000 feet (0.707 kg/m), with rust-inhibitive paint finish.

## 2.5 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers:
1. Armstrong World Industries, Inc.
  2. Chicago Metallic Corporation.
  3. Fry Reglet Corporation.
  4. Gordon, Inc.
  5. MM Systems, Inc.
  6. USG Interiors, Inc.
- 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 fit acoustical tile edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- C. Extruded-Aluminum Edge Moldings and Trim: 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 the following requirements:
1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for alloy and temper 6063-T5.
  2. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
  3. Conversion-Coated Finish: AA-M12C42 (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating).

4. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
5. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating. Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

D. Edge Moldings and Trim:

1. Extruded plastic or metal; provide indicated profiles. Where profiles are not indicated, provide molding with profiles suited to edge profiles of acoustical units and suspension members.
2. Special-purpose moldings: Fabricate the following from extruded aluminum; profiles as indicated.
  - a. Fascia moldings.
3. Provide radius trim as required at bull nose corners and radius walls and surfaces.

E. Exposed Grid: Formed steel with painted finish.

1. Profile: Double-web tee, 15/16 inch wide.
2. Structural classification (ASTM C 635): Intermediate-Duty System.
3. Color and texture: Color to match ceiling panels; standard smooth texture.

F. Hold Down Retention Clips

1. Provide manufacturer's hold down retention or security clips at lay-in ceiling tile systems at the following locations.
  - a. Fire-rated lay-in ceiling tile or panel systems along with ceiling grid systems approved by the Building Department having jurisdiction.
  - b. Lay-in ceilings located in areas where wind-uplift is probable.
  - c. Refer to drawings for other locations.

## 2.6 ACOUSTICAL SEALANT

A. Manufacturer's Products:

1. Acoustical Sealant for Exposed and Concealed Joints:
  - a. Pecora Corp; AC-20 FTR Acoustical and Insulation Sealant.
  - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

## 2.7 MISCELLANEOUS MATERIALS

- A. Tile Adhesive: Type recommended by tile manufacturer, bearing UL label for Class 0-25 flame spread.
- B. Staples: Divergent-point staples and as directed by the Acoustic Tile manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile 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 tile ceilings.

### 3.2 PREPARATION

- A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

### 3.3 INSTALLATION, SUSPENDED ACOUSTICAL TILE CEILINGS

- A. General: Install acoustical tile ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
  - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate.



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 structure to which hangers are attached and type of hanger involved.
  6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  7. Do not attach hangers to steel deck tabs.
  8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  9. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
- 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 post-installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
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 (400 mm)** o.c. and not more than **3 inches (75 mm)** from ends, leveling with ceiling suspension system to a tolerance of **1/8 inch in 12 feet (3.2 mm in 3.66 m)**. 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 tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
  2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced **12 inches (305 mm)** o.c.
  3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

### 3.4 INSTALLATION, DIRECTLY ATTACHED ACOUSTICAL TILE CEILINGS

- A. Adhesive Installation: Install acoustical tile by bonding to substrate, using amount of adhesive and procedure recommended in writing by tile manufacturer and as follows:
1. Remove loose dust from backs of tiles by brushing and prime them with a thin coat of adhesive.
  2. Install splines in joints between tiles; maintain level of bottom surface of tiles to a tolerance of **1/8 inch in 12 feet (3 mm in 3.6 m)** and not exceeding **1/4 inch (6.35 mm)** cumulatively.
  3. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.

- B. Stapled Installation: Fasten acoustical tile to substrate using a minimum of two staples per tile that are installed in flanges of tile and as follows:
1. Form double-lapped joint between tiles by securely pressing tile tongues into corresponding tile grooves.
  2. Maintain level of bottom surface of tiles to a tolerance of **1/8 inch in 12 feet (3 mm in 3.6 m)** and not exceeding **1/4 inch (6.35 mm)** cumulatively. Shim tile or correct substrate as required to maintain tolerance.
  3. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.

### 3.5 CLEANING

- A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired.

END OF SECTION 09 5123

## SECTION 09 6519 – 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. This Section includes the following:
  - 1. Solid vinyl floor tile.
  - 2. Rubber floor tile.
  - 3. Luxury vinyl tile.
  - 4. Vinyl composition tile (VCT).
  - 5. Resilient wall base and accessories.
  - 6. Resilient Floor and Base Types – For information, refer to Schedules located on Drawings.
- B. Related Sections include the following:
  - 1. Division 03 5416 Section "Hydraulic Cement Underlayment."

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Drawings of floor pattern graphics, including dimensions and reference locations.
- C. Samples for Verification: Full-size units of each color and pattern of resilient floor tile, wall bases and accessories.
- D. Maintenance Data: For resilient products to include in maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

#### 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 (10 deg C) or more than 90 deg F (32 deg C). Store tiles on flat surfaces.

## 1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before and 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish 1 box for every fifty (50) boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
  - 2. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.
  - 3. Resilient Stair Materials: Furnish accessories of not less than one-half (1/2) of a stair floor to floor height.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturer Product – Basis-of-Design: The design for each material type is based on the product named. Subject to compliance with requirements, provide the named product or a comparable product acceptable to the Architect by one of the other manufacturers listed.
- B. Manufacturers as indicated on the Drawings and as listed below.
  - 1. Armstrong World Industries, Inc.
  - 2. Mannington
  - 3. Tarkett
  - 4. Johnsonite, Inc.
  - 5. Burke Mercer Flooring Products – Division Burke Industries.
  - 6. Roppe Corporation.
  - 7. Nora Rubber Flooring.
  - 8. Marley

### 2.2 COLORS AND PATTERNS

- A. Colors and Patterns: As selected by Architect from manufacturer's full range.

## 2.3 SOLID VINYL FLOOR TILE

- A. Solid Vinyl Floor Tile: ASTM F 1700.
  - 1. Manufacturer Product – Basis of Design: Material Information and Selection.
    - a. Refer to Schedules located in the Architect's Drawings.
- B. Fire-Test-Response Characteristics:
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.
- C. Post Installation Initial Cleaning:
  - 1. The initial cleaning of rubber flooring products is especially important. First, job site conditions usually cause grit and dirt to accumulate. Second, the desired sheen level will need to be selected.
  - 2. Initial cleaning should not be performed until seventy-two (72) hours after installation.
- D. Cleaning:
  - 1. Thoroughly sweep or vacuum the entire area of the flooring products to remove all loose dirt and grit.
  - 2. Prepare a cleaning solution of mixing 1-2 oz. of a neutral detergent (pH of 7-8) or Taski's "Profi" or Johnson Wax Professional's "Stride Neutral" per gallon of warm water. The dilution selected depends on light to heavy soil conditions.
  - 3. Apply the cleaning solution with a nylon or rayon mop, and let stand for 5-15 minutes. IMPORTANT: Do not let the solution dry.
  - 4. Scrub the rubber flooring products:
    - a. Small area installations: Use a deck brush.
    - b. Large area installations: Use a 22 gauge flagged nylon bristle brush on a scrubbing machine. Single Disc Machine (150-300 RPM).
  - 5. Wet vacuum, or mop up, the cleaning solution.
  - 6. Rinse with clean cold water, and then remove all water by vacuum or mop.
  - 7. Allow the flooring to dry thoroughly. (Approximately one hour.)

## 2.4 RUBBER FLOOR AND STAIR TILE

- A. Rubber Floor Tile: ASTM F 1344.
  - 1. Manufacturers Product – Basis of Design: Material Information and Selection.
    - a. Refer to Schedules located in the Architect's Drawings.
- B. Fire-Test-Response Characteristics:
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.
- C. Post Installation Initial Cleaning:
  - 1. The initial cleaning of rubber flooring products is especially important. First, job site conditions usually cause grit and dirt to accumulate. Second, the desired sheen level will need to be selected.

2. Initial cleaning should not be performed until seventy-two (72) hours after installation.

D. Cleaning:

1. Thoroughly sweep or vacuum the entire area of the flooring products to remove all loose dirt and grit.
2. Prepare a cleaning solution of mixing 1-2 oz. of a neutral detergent (pH of 7-8) or Taski's "Profi" or Johnson Wax Professional's "Stride Neutral" per gallon of warm water. The dilution selected depends on light to heavy soil conditions.
3. Apply the cleaning solution with a nylon or rayon mop, and let stand for 5-15 minutes. IMPORTANT: Do not let the solution dry.
4. Scrub the rubber flooring products:
  - a. Small area installations: Use a deck brush.
  - b. Large area installations: Use a 22 gauge flagged nylon bristle brush on a scrubbing machine. Single Disc Machine (150-300).
5. Wet vacuum, or mop up, the cleaning solution.
6. Rinse with clean cold water, and then remove all water by vacuum or mop.
7. Allow the flooring to dry thoroughly. (Approximately one hour.)

## 2.5 VINYL COMPOSITION TILE

A. Vinyl Composition Tile (VCT): ASTM F 1066.

1. Manufacturer Product – Basis of Design: Material Information and Selection.
  - a. Refer to Schedules located in the Architect's Drawings.

B. Fire-Test-Response Characteristics:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

## 2.6 RESILIENT WALL BASE

A. Wall Base: ASTM F 1861.

1. Manufacturers Product – Basis of Design: Material Information and Selection. Refer to Schedules located in the Architect's Drawings.
2. Height: 4 inches nominal - typical.
3. Length: Coils.
4. Style: Standard cove base at tile and tile/carpet locations.
5. Corners (outside and inside): Provide prefabricated units matching base in color and finish. Required at all bullnosed corners.

## 2.7 RESILIENT STAIR ACCESSORIES

A. Treads: FS RR-T-650.

1. Manufacturer Product – Basis of Design: Material Information and Selection.
  - a. Refer to Schedules located in the Architect's Drawings.

B. Manufacturers Product – Basis of Design: Material Information and Selection.

1. Refer to Schedules located in the Architect's Drawings.

- a. Resilient Stair Nosings and Risers:
  - 1) Nosings/Risers: Solid rubber, one-piece nosing-tread-riser. Tile material used for stair landings.
- b. Treads: Solid rubber.
- C. Stringers: Of same thickness as risers, height and length after cutting to fit risers and treads and to cover stair stringers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads. Base material is NOT required on steel stair stringers.
- D. Fire-Test-Response Characteristics:
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

## 2.8 RESILIENT MOLDING ACCESSORY

- A. Description: Carpet edge for glue-down applications; Nosing for resilient floor covering; Reducer strip for resilient floor covering; Joiner for tile and carpet, unless otherwise noted on the Architect's Drawings.
  - 1. Burke Mercer Flooring Products.
  - 2. Johnsonite.
  - 3. Marley
  - 4. Roppe Corporation.
- B. Material: Rubber.

## 2.9 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 manufacturer to suit resilient products and substrate conditions indicated.
- C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

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.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  3. Moisture Testing:
    - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
  1. Install resilient products when they are same temperature as space where they are to be installed.
- G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.

### 3.3 TILE INSTALLATION

- A. Lay out 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 square with room axis unless otherwise indicated.



- B. Match 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.
  - 1. Lay tiles with grain running in one direction unless otherwise indicated.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. 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, nonstaining marking device.
- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere tiles to flooring 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 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.
- G. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

### 3.5 RESILIENT ACCESSORY INSTALLATION

#### A. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

#### 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 coverings that would otherwise be exposed.

### 3.6 CLEANING AND PROTECTION

#### A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

a. Do not wash surfaces until after time period recommended by manufacturer.

#### B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
  - a. Use commercially available product acceptable to manufacturer.
  - b. Coordinate selection of floor polish with Owner's maintenance service.
2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09 6519

## SECTION 09 6816 – SHEET CARPETING AND TILE CARPETING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Tufted carpet.
  - 2. Woven carpet.
  - 3. Carpet cushion.
  - 4. Carpet tile.
  - 5. Sheet Carpet and Carpet Tile types are scheduled in the Drawings.
- B. Related Sections include the following:
  - 1. Division 03 5416 Section "Hydraulic Cement Underlayment."
  - 2. Division 09 6519 Section "Resilient Tile Flooring."

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.
- B. Shop Drawings: Show the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
  - 2. Existing flooring materials to be removed.
  - 3. Existing flooring materials to remain.
  - 4. Carpet type, color.
  - 5. Seam locations, types, and methods.
  - 6. Type of installation.
  - 7. Pattern type, repeat size, location, direction, and starting point.
  - 8. Pile direction.
  - 9. Type, color, and location of insets and borders.
  - 10. Type, color, and location of edge, transition, and other accessory strips.
  - 11. Transition details to other flooring materials.
  - 12. Type of cushion.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet: 12-inch- (300-mm-) square Sample.
2. Exposed Edge Stripping and Accessory: 12-inch- (300-mm-) long Samples.
3. Carpet Cushion: 6-inch- (150-mm-) square Sample.

D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

E. Maintenance Data:

1. Methods for maintaining carpet, 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.

#### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer in business at least five (5) years who is certified by the Floor Covering Installation Board.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 01 Section "Product Requirements" for Substitutions Requests.

D. Mockups: Before installing carpet, install mockups for each type of carpet installation required to demonstrate aesthetic effects and qualities of materials and execution. Install mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Obtain Architect's approval of mockups before starting work.
3. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 05, "Storage and Handling."

B. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, fire hazard classification, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging and warping. Maintain temperature in storage area above 40° F.

#### 1.6 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

- B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

## 1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, loss of face fiber, edge raveling, snags, runs, and delamination.
  - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Special Carpet Cushion Warranty: Written warranty, signed by carpet cushion manufacturer agreeing to replace carpet cushion that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet cushion due to unusual traffic, failure of substrate, vandalism, or abuse. Failure includes, but is not limited to, permanent indentation or compression.
  - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

## 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type.
  - 2. Carpet Tile: Full-sized units equal to five percent (5%) of the amount of each type.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS - CARPET

- A. Manufacturers Product – Basis of Design: The design for each material type is based on the product named. Subject to compliance with the requirements, provide the named product or a comparable product acceptable to the Architect by one of the other manufacturers.

1. Carpet manufacturers as indicated on drawings and as listed below:
  - a. Shaw Carpet.
- B. Carpet Types – Material Information and Selection:
  1. Refer to schedule located in the Architect's drawings.
- C. Performance Characteristics: As follows:
  1. Critical Radiant Flux Classification: Not less than 0.22 W/sq. cm.
  2. Dry Breaking Strength: Not less than 100 lbf (445 N) per ASTM D 2646.
  3. Resistance to Insects: Comply with AATCC-24.
  4. Noise Reduction Coefficient (NRC): Per ASTM C 423.
  5. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165.
  6. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC-16.
  7. 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; no fungal growth; per AATCC-174.
  8. Electric static dissipation.

## 2.2 MANUFACTURERS – CARPET TILE

- A. Manufacturers Product – Basis of Design: The design for each material type is based on the product named. Subject to compliance with the requirements, provide the named product or a comparable product acceptable to the Architect by one of the other manufacturers.
  1. Carpet Tile Manufacturers as indicated on drawings and as listed below:
    - a. Shaw Carpet.
- B. Carpet Types – Material Information and Selection:
  1. Refer to schedule located in the Architect's drawings.
- C. Performance Characteristics: As follows:
  1. Critical Radiant Flux Classification: Not less than 0.22 W/sq. cm.
  2. Dry Breaking Strength: Not less than 100 lbf (445 N) per ASTM D 2646.
  3. Resistance to Insects: Comply with AATCC-24.
  4. Noise Reduction Coefficient (NRC): Per ASTM C 423.
  5. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165.
  6. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC-16.
  7. 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; no fungal growth; per AATCC-174.
  8. Electric static dissipation.

## 2.3 CARPET CUSHION

- A. Products: Subject to compliance with requirements, products that may be incorporated into the Work to comply with traffic classification criteria.

1. Carpet cushions proposed must comply to high density load-carrying capacity.
- B. Traffic Classification: CCC Class II, heavy traffic.
- C. Fiber Cushion: Rubberized jute, mothproofed and sterilized, mildew resistant.
- D. Rubber Cushion: Textured flat.
- E. Polyurethane-Foam Cushion: Densified.
- F. Performance Characteristics: As follows:
  1. Critical Radiant Flux Classification: Not less than 0.22 W/sq. cm.
- G. Provide carpet cushion that complies with the content when tested according to ASTM D 5116:

## 2.4 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet manufacturer, carpet cushion manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by carpet manufacturer, carpet cushion manufacturer.
  1. Provide adhesives that comply with the content when tested according to ASTM D 5116.
- C. Tackless Carpet Stripping: Water-resistant plywood in strips as required to match cushion thickness and that comply with CRI 104, Section 11.3.
- D. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- E. Metal Edge Strips: Extruded aluminum with mill finish of 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 for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. For Wood Subfloors: Verify the following:

1. Under-layment over subfloor complies with requirements specified in Division 06 Section "Rough Carpentry."
2. Under-layment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

### 3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.
- B. Install trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

### 3.3 INSTALLATION

- A. Direct-Glue-Down Installation: Comply with CRI 104, Section 8, "Direct Glue-Down Installation."
- B. Double-Glue-Down Installation: Comply with CRI 104, Section 9, "Double Glue-Down Installation."
- C. Carpet with Attached-Cushion Installation: Comply with CRI 104, Section 10, "Attached Cushion."
- D. Carpet with Preapplied Adhesive Installation: Comply with CRI 104, Section 10.4, "Pre-Applied Adhesive Systems (Peel and Stick)."
- E. Hook-and-Loop Installation: Comply with CRI 104, Section 10.5, "Hook and Loop Technology."
- F. Stretch-in Installation: Comply with CRI 104, Section 11, "Stretch-in Installation."
- G. Stair Installation: Comply with CRI 104, Section 12, "Carpet on Stairs."
- H. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.



1. Bevel adjoining border edges at seams with hand shears.
2. Level adjoining border edges.

- I. Do not bridge building expansion joints with carpet.
- J. Cut and fit carpet 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 by carpet manufacturer.
- K. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- L. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- M. Install pattern parallel to walls and borders, unless otherwise indicated.
- N. Install carpet cushion seams at 90-degree angle with carpet seams.

#### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
  1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
  2. Remove yarns that protrude from carpet surface.
  3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."
- C. Protect carpet 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 manufacturer.

END OF SECTION 09 6816

## SECTION 09 9100 - PAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
  - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections of work.
  - 2. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
  - 3. Paint walls/ceilings with primer where finished coverings are to be installed.
  - 4. Paint Types, Colors and Finishes – For information, refer to Schedules located on Drawings.
  - 5. Use color prime system per manufacturer's recommendation.
  - 6. Repair and repainting of metal lockers or other metal surfaces.
  - 7. Repair and painting of existing, hard, slick and glossy surface materials.
- B. Paint exposed surfaces, except where natural finish indicates that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint manufacturers prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
  - 1. Division 05 1200 Section "Structural Steel Framing" for shop priming structural steel.
  - 2. Division 05 5000 Section "Metal Fabrications" for shop priming ferrous metal.
  - 3. Division 06 4023 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
  - 4. Division 08 1113 Section "Hollow Doors and Frames" for factory priming steel doors and frames.

### 1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
  3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
  4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

### 1.4 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
1. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
  2. Submit three (3) samples on substrates for Architect's review of color and texture only:
    - a. Size: 6" x 6" minimum on actual material proposed in the project.
    - b. Paint color chips and stain colors.

### 1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual in continuous business at least five (5) years experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project. Use only thinners approved by the paint manufacturer.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
1. Product name or title of material.
  2. Product description (generic classification or binder type).

3. Manufacturer's stock number and date of manufacture.
  4. Contents by volume, for pigment and vehicle constituents.
  5. Thinning instructions.
  6. Application instructions.
  7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of **45 deg F (7 deg C)**. Maintain storage containers in a clean condition, free of foreign materials and residue.
1. Protect from freezing and excessive temperatures where necessary. Keep storage area neat, orderly and well ventilated. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

## 1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between **50 and 90 deg F (10 and 32 deg C)** or per manufacturer's written instructions.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between **45 and 95 deg F (7 and 35 deg C)**.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.

## 1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
1. Quantity: Furnish Owner with extra paint materials in quantities indicated below:
    - a. Two (2) full unopened gallons of each type of color and finish of paint.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Basis of Design: Sherwin-Williams Co. (S-W).
  2. Other manufacturers must meet or exceed the properties of the Basis of Design manufacturer. Other acceptable manufacturers are:
    - a. Benjamin Moore

b. PPG (Pittsburgh Paints)

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following:
1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:
- a. Acrolein.
  - b. Acrylonitrile.
  - c. Antimony.
  - d. Benzene.
  - e. Butyl benzyl phthalate.
  - f. Cadmium.
  - g. Di (2-ethylhexyl) phthalate.
  - h. Di-n-butyl phthalate.
  - i. Di-n-octyl phthalate.
  - j. 1,2-dichlorobenzene.
  - k. Diethyl phthalate.
  - l. Dimethyl phthalate.
  - m. Ethylbenzene.
  - n. Formaldehyde.
  - o. Hexavalent chromium.
  - p. Isophorone.
  - q. Lead.
  - r. Mercury.
  - s. Methyl ethyl ketone.
  - t. Methyl isobutyl ketone.
  - u. Methylene chloride.
  - v. Naphthalene.
  - w. Toluene (methylbenzene).
  - x. 1,1,1-trichloroethane.
  - y. Vinyl chloride.
- D. Colors: Colors and Finishes are indicated on the Architect's drawings.

## 2.3 PAINT SCHEDULE

### A. Paint 1 (P1) for Interior Walls

1. Single component water-based epoxy
2. Topcoat- Sherwin Williams Pro-Industrial Pre-Catalyzed Waterbased Epoxy
3. Sheen- Eggshell or semi-gloss
4. Surface preparation-Follow manufacturers written recommendation.
5. Surface material- Concrete Masonry Units
  - a. Primer: SW PrepRite Block Filler
  - b. 1<sup>st</sup> Coat: SW Pro Industrial Pre-Catalyzed Waterbased Epoxy
  - c. 2<sup>nd</sup> Coat: SW Pro Industrial Pre-Catalyzed Waterbased Epoxy
6. Surface material- Gypsum Board
  - a. Primer: SW ProMar 200 Zero VOC Latex Primer
  - b. 1<sup>st</sup> Coat: SW Pro Industrial Pre-Catalyzed Waterbased Epoxy
  - c. 2<sup>nd</sup> Coat: SW Pro Industrial Pre-Catalyzed Waterbased Epoxy
7. Surface material- Wood
  - a. Primer: SW PrepRite ProBlock Latex Primer/Sealer
  - b. 1<sup>st</sup> Coat: SW Pro Industrial Pre-Catalyzed Waterbased Epoxy
  - c. 2<sup>nd</sup> Coat: SW Pro Industrial Pre-Catalyzed Waterbased Epoxy
8. Surface Material- Ferrous and non-ferrous metal
  - a. Primer: SW Pro Industrial Pro-Cryl Universal Primer
  - b. 1<sup>st</sup> Coat: SW Pro Industrial Pre-Catalyzed Waterbased Epoxy
  - c. 2<sup>nd</sup> Coat: SW Pro Industrial Pre-Catalyzed Waterbased Epoxy

### B. Paint 2 (P2) for Interior Walls

1. Zero VOC vinyl acrylic
2. Topcoat- Sherwin Williams ProMar 200 Zero VOC Interior Latex
3. Sheen- Flat, Low Gloss, Eggshell, Semi-Gloss and Gloss
4. Surface preparation-Follow manufacturers written recommendation.
5. Surface material- Concrete Masonry Units
  - a. Primer: SW PrepRite Block Filler
  - b. 1<sup>st</sup> Coat: SW ProMar 200 Zero VOC Interior Latex
  - c. 2<sup>nd</sup> Coat: SW ProMar 200 Zero VOC Interior Latex
6. Surface material- Gypsum Board
  - a. Primer: SW ProMar 200 Zero VOC Latex Primer
  - b. 1<sup>st</sup> Coat: SW ProMar 200 Zero VOC Interior Latex
  - c. 2<sup>nd</sup> Coat: SW ProMar 200 Zero VOC Interior Latex

### C. Paint 3 (P3) for Interior

1. Single component acrylic
2. Topcoat- Sherwin Williams Pro Industrial Acrylic Coating
3. Sheen- Eggshell, Semi-Gloss and Gloss
4. Surface preparation-Follow manufacturers written recommendation.
5. Surface material- Wood
  - a. Primer: SW PrepRite ProBlock Latex Primer/Sealer
  - b. 1<sup>st</sup> Coat: SW Pro Industrial Acrylic
  - c. 2<sup>nd</sup> Coat: SW SW Pro Industrial Acrylic

### D. Paint 4 (P4) for Interior

1. Two component water based epoxy
2. Topcoat- Sherwin Williams Pro Industrial Water Based Catalyzed Epoxy

3. Sheen- Eggshell and Gloss
  4. Surface preparation-Follow manufacturers written recommendation.
  5. Surface material- Concrete Masonry Units
    - a. Primer: SW Loxon Block Surfer
    - b. 1<sup>st</sup> Coat: SW Pro Industrial Water Based Catalyzed Epoxy
    - c. 2<sup>nd</sup> Coat: SW Pro Industrial Water Based Catalyzed Epoxy
  6. Surface material- Ferrous and Non-ferrous metals
    - a. Primer: SW Pro Industrial Pro-Cryl
    - b. 1<sup>st</sup> Coat: SW Pro Industrial Water Based Catalyzed Epoxy
    - c. 2<sup>nd</sup> Coat: SW Pro Industrial Water Based Catalyzed Epoxy
- E. Paint 5 (P5) for Interior Wet Areas
1. Fast cure epoxy
  2. Topcoat- Sherwin Williams Macropoxy 646-100 Fast Cure Epoxy
  3. Sheen- Eggshell and Semi-Gloss
  4. Surface preparation-Follow manufacturers written recommendation.
  5. Surface material- Concrete Masonry Units (Wet Areas)
    - a. Primer: SW Kem Cati-Coat HS Epoxy Filler/Sealer
    - b. 1<sup>st</sup> Coat: SW Macropoxy 646-100 Fast Cure Epoxy
    - c. 2<sup>nd</sup> Coat: SW Macropoxy 646-100 Fast Cure Epoxy
- F. Paint 6 (P6) for Restrooms Glazed CMU walls
1. Prep: Clean well with heavy degreaser and mechanically abrade to thoroughly remove gloss as recommended by the manufacturer of epoxy wall paint. Mechanical abrade is key to get proper adhesion.
  2. Primer: Sherwin-Williams: Extreme Bond Primer, B51 Series
  3. Topcoats: Sherwin-Williams Pro Industrial Pre Catalyzed Waterbased Epoxy, K46 Series. Sheens: Eg-shel or semi-gloss
  4. Alternative Topcoats: Sherwin-Williams Pro Industrial Water Based Catalyzed Epoxy B73 Series. Sheens: Eg-shel or gloss
  5. Notes: Mock up and adhesion test must be completed prior to start of work
- G. Paint 10 (P10) for Interior Exposed Ceilings
1. Acrylic Dryfall
  2. Topcoat- Sherwin Williams Pro Industrial Waterborne Acrylic Dryfall
  3. Sheen- Flat, Eggshell and Semi-Gloss
  4. Surface preparation-Follow manufacturers written recommendation.
  5. Surface material- Ferrous and Non-ferrous metal
    - a. Primer: SW Kem Pro Industrial Pro-Cryl Universal Primer
    - b. 1<sup>st</sup> Coat: SW Pro Industrial Waterborne Acrylic Dryfall
    - c. 2<sup>nd</sup> Coat: SW Pro Industrial Waterborne Acrylic Dryfall
- H. Paint 11 (P11) for Interior Ceilings
1. Zero VOC vinyl acrylic
  2. Topcoat- Sherwin Williams ProMar 200 Zero VOC Interior Latex
  3. Sheen- Flat
  4. Surface preparation-Follow manufacturers written recommendation.
  5. Surface material- Masonry and Concrete
    - a. Primer: SW Loxon Concrete and Masonry Primer/Sealer
    - b. 1<sup>st</sup> Coat: SW ProMar 200 Zero VOC Interior Latex
    - c. 2<sup>nd</sup> Coat: SW ProMar 200 Zero VOC Interior Latex

6. Surface material- Gypsum Board
  - a. Primer: SW ProMar 200 Zero VOC Latex Primer
  - b. 1<sup>st</sup> Coat: SW ProMar 200 Zero VOC Interior Latex
  - c. 2<sup>nd</sup> Coat: SW ProMar 200 Zero VOC Interior Latex
- I. Paint 20 (P20) for Concrete Floors
  1. Concrete sealer and finish
  2. Topcoat- Sherwin Williams ArmorSeal 8100 Finish
  3. Sheen- Satin
  4. Surface preparation-Follow manufacturers written recommendation.
  5. Surface material- Concrete
    - a. 1<sup>st</sup> Coat: SW ArmorSeal 8100 Finish
    - b. 2<sup>nd</sup> Coat: SW ArmorSeal 8100 Finish
- J. Paint 22 (P22) for Epoxy Floors - General Polymers MER II system
  1. Primer - SW General Polymers 3579
  2. Membrane - SW General Polymers 3555
  3. Wearcourse - SW General Polymers 3555
  4. Broadcast - GP5310-8 Dry Silica Sand (20-40 mesh)
  5. Topcoat - SW General Polymers 3746
- K. Paint 27 (P27) for electrostatic painting of existing metal surfaces (lockers)
  1. Electrostatic Painting: Ransburg #2 electrostatic deposition system combined with two (2) component type epoxy material as manufactured and prepared by Spectrum. The final coat of paint must be a two (2) part polyamide catalyzed epoxy enamel that has a combination of adhesion toughness, wear and chemical resistance properties. The lockers shall be painted on the outside face of the door, the leading edge opposite the hinges, and all exposed sides.
  2. Painting Operation on Existing Lockers: The painting operation shall consist of the following:
  3. Remove all existing locks, number plates and handles and other attached items in order to have a clean, neat appearance at completion. Mask all items neatly including existing items that cannot be removed for painting.
  4. Lockers and other equipment shall be sanded to remove all rust and surface irritations that could flaw the final coat. Any areas that cannot be totally sanded will be scuffed in order to stop any adhesion problems.
  5. Degrease and clean lockers and other equipment with a solvent to remove any surface contamination which could cause paint adhesion problems. The solvent shall have a flash point above 100 degrees Fahrenheit to present minimal fire hazard.
  6. Prime lockers with a heavy duty rust inhibitive primer. Apply an intermediate coat between old painted surfaces and the new coating that could lift the existing paint.
  7. The lockers and other equipment surfaces shall be dust coated in order to prevent runs and stop lifting.
  8. The lockers and other equipment shall be final coated with a film of uniform thickness and have a smooth and clean appearance.
  9. Reinstall locks, number plates and handles and other items. Remove all masking and dispose of all waste properly leaving job site neat and clean.
- L. Paint 23 (P23) high performance coating for Pool Environments
- M. Paint 24 (P24) Painting and repainting of existing steel guardrail and angles.
  1. Remove existing paint finish
  2. Surface Preparation: as recommended by coating manufacturer.
  3. Base Coat: TNEMEC Series 161 Tnemec-Fascure Polyamide Epoxy corrosion resistant coating for protection against abrasion and mild chemical contact at 5.0 to 6.0 mils



4. Finish Coat: TNEMEC Series 75 Endura-Shield Alihatic Acrylic Polyurethane highly resistant coating for abrasion, wet conditions corrosive fumes, chemical contact and excellent weathering properties at 2.5 to 3.0 mils DFT.
- N. Paint 25 (P25) Dry Erase Coating
1. Clear Gloss two-coat system
  2. Painted over finished paint system and color
- O. Paint 26 (P26) Stage Wood Flooring
1. Strip flooring shall be stained using a minimum of three (3) penetrating applications.
  2. Stain Dye Color: As selected by Architect.
  3. Flooring shall be finished with one application of a finish coat: 2 parts varnish to 1 part dulling agent, or per Manufacturer's standard finishes acceptable to the Architect.
  4. Do not use plastic coatings of any type.
- P. Paint 30 (P30) Exterior ferrous and non-ferrous metal
1. Two-component, waterbased acrylic urethane enamel
  2. Topcoat- Sherwin Williams Pro Industrial Water Based Acrolon 100 Urethane
  3. Sheen- Flat, Satin, Semi-Gloss and Gloss
  4. Surface preparation-Follow manufacturers written recommendation.
  5. Surface material- Ferrous and non-ferrous metal
    - a. Primer: SW Pro Industrial Pro-Cryl Universal Primer
    - b. 1<sup>st</sup> Coat: SW Pro Industrial Water Based Acrolon 100 Urethane
    - c. 2<sup>nd</sup> Coat: SW Pro Industrial Water Based Acrolon 100 Urethane
- Q. Paint 31 (P31) Exterior Gypsum Board, Plaster or EIFS
1. Acrylic
  2. Topcoat- Sherwin Williams A-100 Exterior Latex
  3. Sheen- Flat, Satin or Gloss
  4. Surface preparation-Follow manufacturers written recommendation.
  5. Surface material- Gypsum Board, Plaster or EIFS
    - a. Primer: SW Loxon Concrete and masonry Primer Sealer
    - b. 1<sup>st</sup> Coat: SW A-100 Exterior Latex
    - c. 2<sup>nd</sup> Coat: SW A-100 Exterior Latex
- R. **Paint for POOL EXPOSURE**
- S. See spec section 09 9600 HIGH PERFORMANCE COATINGS.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
1. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

### 3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Surface Preparation
  - 1. Existing hollow metal frames: SSPC-SP3 Power Tool Clean:
    - a. Power tool cleaning removes all loose mill scale, loose rust and other detrimental foreign matter. Before power tool cleaning, remove visible oil, grease, soluble welding residues and salts by methods outlined in SSPC-SP1. For complete instructions, refer to Steel Structures Paint Council Surface preparation Specification No. 3.
- C. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
  - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime.
  - 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
    - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
  - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
    - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes

- and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
  - c. If transparent finish is required, backprime with spar varnish.
  - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
  - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
    - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
    - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
  5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- E. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
  3. Use only thinners approved by paint manufacturer and only within recommended limits.
- F. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

### 3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
  2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  3. Provide finish coats that are compatible with primers used.
  4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in

- place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
  9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
  10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
  2. Omit primer over metal surfaces that have been shop primed and touchup painted.
  3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
  2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
  3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
  2. Uninsulated plastic piping.
  3. Pipe hangers and supports.

4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
  - a. Refer to Mechanical Specifications.

G. Electrical items to be painted include, but are not limited to, the following:

1. Switchgear.
2. Panelboards.
3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
  - a. Refer to Electrical Specifications.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

### 3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove non-complying paint from Project site, pay for testing, and repaint surfaces previously coated with the non-complying paint. If necessary, Contractor may be required to remove non-complying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

### 3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
  - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION 09 9100

## SECTION 12 2413 - ROLLER WINDOW SHADES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes, but not limited to roller shades:
  - 1. Manual roller shades.
- B. Related Sections include the following:
  - 1. Division 05 5000 Section "Formed-Metal Fabrications" for custom sheet-metal pockets for window treatments.
  - 2. Division 06 1000 Section "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
  - 3. Division 08 5113 Sections "Aluminum Windows" for windows, window walls, and curtain walls with roller shades mounted on window frames.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
  - 1. Motorized Shade Operators: Include operating instructions.
  - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.
  - 1. Shade Operators: Show locations and details for installing operator Motorized components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
  - 2. Wiring Diagrams: Power, system, and control wiring.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling suspension system members and attachment to building structure.
  - 2. Ceiling-mounted or penetrating items including light fixtures; air outlets and inlets; speakers; sprinklers; recessed shades; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.

3. Shade mounting assembly and attachment.
4. Size and location of access to shade operator, motor, and adjustable components.

D. Samples for Verification:

1. Shade Material: Not less than 12-inch- (300-mm-) square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
2. Valance: Full-size unit, not less than 12 inches (300 mm) long.

E. Window Treatment Schedule: Include roller shades in schedule using same room designations indicated on Drawings.

F. Product Certificates: For each type of roller shade product, signed by product manufacturer.

G. Product Test Reports: For each type of roller shade product.

H. Maintenance Data: For roller shades to include operation and maintenance manuals.

#### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer in continuous business at least three (3) years and who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, and location of installation using same room designations indicated on Drawings.



## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after construction is completed and finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project.
- 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 operable window units' operation hardware throughout the entire operating range.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Draper Shade & Screen Co., Inc.
  - 2. Hunter Douglas Window Fashions.

### 2.2 ROLLER SHADES

- A. Shades:
  - 1. Materials and Fabrication:
    - a. Shade Brackets: Cadmium plated 1/8" (min.) thick steel of appropriate size and configuration to support shading system.
    - b. Shade Roller Tube(s): 2-1/2" dia. extruded aluminum with integral asymmetrical Snaploc Spline fabric mounting channels.
    - c. Drive Cables: 3/32" diameter clear coated Aircraft quality stainless steel stranded cable.
    - d. Hembar: Exposed extruded aluminum hembar with integral shade mounting splines and wheel carrier assemblies. Painted standard white color.
    - e. Idler Rollers: 2" dia. extruded aluminum tubes with endcaps and bearing assembly brackets.
    - f. Chain-driven roller screen.
  - 2. Fabric:
    - a. Fabric: Greenguard, SheerWeave 2400, Openness Factor 3%, Composition 35% Fiberglass & 65% Vinyl on Fiberglass, color P1429 Oyster/ Pearl Gray. Passed FR tests: CCC-C-521E, ASTM E84-81, ASTM E162, and NFPA 701 Large-Small Scale Vertical Burn test.
- B. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as required for removable design for access.

- C. Top/Back Cover: L shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.
- D. Pocket-Style Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.
- E. Pocket with Ceiling Slot Opening: Six-sided box units for recessed installation; fabricated from formed-steel sheet, extruded aluminum, or wood; with a bottom consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or openable, continuous metal access panel concealing rollers, brackets, and operating hardware and operators within.
- F. Skylight Shades: Manufacturer's complete system for operable skylight shades, including operator, operating hardware, and accessories for smooth operation, designed for installation in horizontal position or inclined position, slope as indicated on Drawings.
  - 1. Side Channels and Bottom Channel or Angle: Manufacturer's standard design for concealing rollers, operator take-up operating hardware, and accessories.
  - 2. Shade Band Retention System: Manufacturer's standard design for guiding shade band material through range of travel and holding shade band flat and taut with edges of material within side channels and/or firmly attached to cables or wires; including concealed battens or rods connected to fabric guides or exposed idler rollers for stiffening shade band material across glazed opening.
- G. Shade Operation: Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
  - 1. Manufacturer's complete system including all necessary accessories, supports and connections.
- H. Valance: Style matching hem; as indicated by manufacturer's designation color.
- I. Mounting: Mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
- J. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard for anchoring roller shade bottom in place and keeping shade band material taut.

## 2.3 ROLLER SHADE FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
  - 1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings.

1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch (6 mm) from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
  2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories.
- F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

#### 3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass, unless otherwise indicated. Allow clearances for window operation hardware.
- B. Connections: Connect motorized operators to building electrical system.

#### 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. 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.
- B. Replace damaged roller shades as directed by the Architect.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION 12 2413

## SECTION 12 3210 – INSTITUTIONAL CABINET CASEWORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes base and wall cabinets of the following:
  - 1. Plastic-laminate-faced wood cabinets of stock design.
  - 2. Plastic-laminate countertops.
  - 3. Wall shelving.
  - 4. Casework information is scheduled on the Drawings.
- B. Related Sections include the following:
  - 1. Division 06 1000 Section "Rough Carpentry" for wood blocking for anchoring institutional casework.
  - 2. Division 06 4023 Section "Interior Architectural Woodwork."
  - 3. Division 09 2900 Section "Gypsum Board" for reinforcements in gypsum board partitions for anchoring institutional casework.
  - 4. Division 09 6519 Section "Resilient Tile Flooring." for resilient base applied to institutional casework.

#### 1.3 SCOPE OF WORK

- A. Furnish and install casework and equipment complete with all accessories, control devices and fittings necessary for operation.
- B. Existing Equipment: Verify existing equipment as supplied by Owner at job site for size and location.
- C. Casework Contractor shall include in their bid all cabinet units, aprons, supports, applied facing and other necessary requirements required to complete this package as indicated on drawings and in the specifications.
  - 1. Refer to Specification Division 06 4023 Section "Interior Architectural Woodwork."

#### 1.4 WORK NOT SPECIFIED

- A. Furnishing or installation of resilient base at toe spaces, rough-in, and final connection of plumbing and electrical items.

## 1.5 DEFINITIONS

- A. Exposed Portions of Cabinets: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches (1220 mm) above floor, and surfaces visible in open cabinets.
- B. Semiexposed Portions of Cabinets: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches (1980 mm) or more above floor are defined as semiexposed.
- C. Concealed Portions of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.

## 1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for institutional casework. Include plans, elevations, sections, details, and attachments to other Work.
- C. Samples for Verification: 6-inch- (150-mm-) square Samples for each type of finish, including top material.
  - 1. Full-size sample of actual cabinet construction and finish including countertop showing top, front edge, and backsplash construction.
  - 2. Samples of colors and finishes for each type of unit.
  - 3. Samples of cabinet hardware.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative in business at least five (5) years of institutional casework manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain institutional cabinet casework through one source from a single manufacturer.
- C. Product Designations: Drawings indicate sizes, configurations, and finish material of institutional casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish material, and complying with the Specifications may be considered.
  - 1. Comply with the Manufacturer's Product - "Basis of Design" as indicated and scheduled in the Architect's Drawings.
- D. Product Designations: Drawings indicate institutional casework configurations by referencing WIC design series numbering system as defined in WIC's "Manual of Millwork."

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver institutional casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

## 1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Deliver and install institutional casework when building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where institutional casework is indicated to fit to other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

## 1.10 COORDINATION

- A. Coordinate layout and installation of metal framing and reinforcements in gypsum board assemblies for support of institutional casework.
  - 1. Provide built-in anchorage and support items as required to suit casework installation.

## 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of institutional cabinet casework that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five (5) years from date of Substantial Completion.

## 1.12 EXTRA MATERIALS

- A. Furnish complete touchup kit for each type and finish of institutional casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturer's Product - Basis-of-Design: The design for institutional cabinet casework is scheduled on the Architect's Drawings. Subject to compliance with requirements, provide

the named product or a comparable product acceptable to the Architect complying to specified criteria by one of the following:

1. Plastic-Laminate-Faced Institutional Casework:
  - a. Case Systems, Inc.
  - b. Stevens Industries.
  - c. Mica-Tec
  - d. TMI Systems Design Corporation
  - e. Strata Design
  - f. Requests for substitutions will be considered in accordance with provisions of Section 01600.
  
2. Plastic-Laminate Material:
  - a. Formica Corporation.
  - b. International Paper; Decorative Products Div.
  - c. Laminart.
  - d. Pioneer Plastics Corp.
  - e. Wilsonart International; Div. of Premark International, Inc.

## 2.2 MATERIALS

### A. General:

1. Certified Wood Materials: Provide "Certificates with Bids" on cabinets made from wood and wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."
2. Adhesives: Do not use adhesives that contain urea formaldehyde.
3. Maximum Moisture Content for Lumber: 7.0 percent for hardwood and 12.0 percent for softwood.
4. Hardwood Plywood: HPVA HP-1, either veneer core plywood made without urea formaldehyde.
5. Softwood Plywood: DOC PS 1.
6. Particleboard (shelving only): ANSI A208.1, Grade M-2-Exterior Glue. OR Particleboard: Industrial grade particleboard meeting ANSI A208.1, Type M-3.
7. Medium-Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.
8. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
9. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick matching color doors and drawer fronts.
10. Edgebanding for Wood-Veneered Construction: Minimum 1/8-inch- (3-mm-) thick, solid wood of same species as face veneer.

### B. Exposed Plastic Laminate Wood Cabinet Materials: Type -VGS.

- a. Unless otherwise indicated, provide plastic laminate for exposed surfaces.
- b. Provide plastic laminate for doors and drawer fronts.
- c. Plastic-laminate finished surface materials shall be selected from plastic-laminate manufacturer's full range of colors and finishes.

### C. Semiexposed Cabinet Materials:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of same species as exposed solid wood.



2. Plywood: Hardwood plywood of same species as exposed plywood. Semiexposed backs of plywood with exposed faces shall be same species as faces. Grade B faces and Grade J crossbands.
  3. Plastic Laminate: Type -VGS.
    - a. Provide plastic laminate for semiexposed surfaces, unless otherwise indicated,.
    - b. Provide plastic laminate for interior faces of doors and drawer fronts and where indicated.
  4. Melamine-Faced Particleboard (shelving only): Particleboard with decorative surface of thermally fused, melamine-impregnated web and complying with LMA SAT-1.
  5. Metal for Steel Drawer Pans: Cold-rolled, carbon-steel sheet complying with ASTM A 366/A 366M; matte finish; suitable for exposed applications.
- D. Concealed Cabinet Materials:
1. Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.
  2. Plywood: Hardwood plywood. Concealed backs of plywood with exposed or semiexposed faces shall be same species as faces.
  3. Plastic Laminate: Type -BKL.

## 2.3 DESIGN, COLOR, AND FINISH

- A. Design: Provide institutional casework of the following design:
1. Cabinet Front Design:
    - a. Flush Overlay and radius edges with 1/8 inch maximum gaps.
  2. Design Grain Directions:
    - a. Doors: Vertical Grain.
    - b. Drawers:
      1. Vertical end-grain matching doors.
- B. Wood Colors and Finishes: As selected by Architect from casework manufacturer's full range.
- C. Melamine-Faced Particleboard Colors, Patterns, and Finishes: As selected by Architect from casework manufacturer's full range.
- D. Plastic-Laminate Colors, Patterns, and Finishes: As selected by Architect from casework manufacturer's full range.

## 2.4 CABINET FABRICATION

- A. Wood-Faced Cabinet Construction:
1. Bottoms and Ends of Cabinets, Shelves, and Tops of Wall Cabinets: 3/4-inch (19-mm) plywood.

2. Base Cabinet Top Frames: 3/4-by-2-inch (19-by-51-mm) solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
  3. Base Cabinet Stretchers: 3/4-by-4-1/2-inch (19-by-114-mm) panel product strips or solid wood boards at front and back of cabinet, glued and pinned or screwed.
  4. Base Cabinet Subtops: 3/4-inch (19-mm) panel product glued and pinned or screwed.
  5. Backs of Cabinets: 3/4-inch (19-mm) veneered plywood where exposed and 1/4 inch hardboard or plywood removable back, where not exposed.
  6. Drawer Fronts: 3/4-inch (19-mm) plywood veneer or solid hardwood.
  7. Drawer Sides and Backs: 1/2-inch (12.7-mm) solid wood or plywood, with glued dovetail or multiple-dowel joints.
  8. Drawer Bottoms: 1/2-inch (12.7-mm) plywood glued and dadoed into front, back, and sides of drawers.
  9. Drawer Bodies: Steel drawer pans formed from 0.0359-inch- (0.9-mm-) thick metal, metallic phosphate treated, and finished with manufacturer's standard 2-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and 2 mils (0.05 mm) for system.
  10. Doors 48 Inches (1220 mm) or Less in Height: 3/4 inch (19 mm) thick, with solid hardwood stiles and rails, plywood or medium-density fiberboard cores, and hardwood face veneers and crossbands.
  11. Doors More Than 48 Inches (1220 mm) in Height: 1-1/16 inches (27 mm) thick, with solid hardwood stiles and rails or plywood and hardwood face veneers and crossbands.
  12. Shelves: Total 3/4 inch thick veneered board with veneered surfaces and edges with 1/2 inch solid wood trim of same wood species at the front edge.
- B. Plastic-Laminate-Faced Cabinet Construction:
1. Bottoms and Ends of Cabinets, Shelves, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch (19-mm) plywood or veneer core plywood OR particleboard, plastic-laminate faced on exposed surfaces, melamine faced on semiexposed surfaces.
  2. Backs of Cabinets: Removable 1/4 inch thick plywood or hardboard, plastic-laminate faced on exposed surfaces, melamine faced on semiexposed surfaces.
  3. Drawer Fronts: 3/4-inch (19-mm) plywood, plastic-laminate faced on both sides.
  4. Drawer Sides and Backs: 1/2-inch (12.7-mm) solid wood or plywood, with glued dovetail or multiple-dowel joints.
  5. Drawer Bottoms: 1/2-inch (12.7-mm) plywood glued and dadoed into front, back, and sides of drawers.
  6. Doors: 3/4-inch (19-mm) plywood or medium-density fiberboard with wood stiles and rails, plastic-laminate faced on both sides.
  7. Shelves: Provide 1 inch thick plastic laminate shelves with veneers on all surfaces and edges on particle board or plywood.
  8. Sink Base Cabinets (all sink locations) shall be constructed from APA Marine-grade plywood. Particleboard may NOT be used for the construction of sink base cabinets.
- C. Leg Shoes: Vinyl or rubber, black, open-bottom type.
- D. Base Molding: ASTM F 1861, Type TP (rubber, thermoplastic) or TV (vinyl, thermoplastic), black, 4 inches (100 mm) high. Provide on fronts and exposed sides of free-standing floor-mounted cabinet casework.
1. Style: A, straight with no toe.
- E. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

## 2.5 FINISH FOR WOOD-FACED INSTITUTIONAL CASEWORK

- A. Preparation: Sand lumber and plywood for institutional casework construction before assembling. Sand edges of doors and drawer fronts and molded shapes.
- B. Finishing Closed-Grain Woods: Apply manufacturer's standard two-coat, baked, clear finish consisting of a thermosetting catalyzed sealer and a thermosetting catalyzed conversion varnish. Sand and wipe clean between applications of sealer and topcoat. Provide topcoats on concealed surfaces.
- C. Finishing Open-Grain Woods: Apply manufacturer's standard three-coat, baked, clear finish consisting of a thermosetting catalyzed sealer and two coats of a thermosetting catalyzed conversion varnish. Sand and wipe clean between applications of sealer and topcoat and between topcoats. Provide topcoats on concealed surfaces.

## 2.6 CASEWORK HARDWARE

- A. Hardware, General: Provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware complying with requirements indicated.
  - 1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
- B. Butt Hinges: Stainless-steel or Chrome-plated, semiconcealed, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 hinges for doors less than 48 inches (1220 mm) high and 3 hinges for doors more than 48 inches (1220 mm) high.
- C. Pulls: Solid stainless-steel wire pulls, unless otherwise indicated, fastened from back with two screws. For sliding doors, provide recessed stainless-steel or chrome-plated flush-pulls. Provide 2 pulls for drawers more than 24 inches (600 mm) wide.
- D. Door Catches: Zinc-plated, nylon-roller spring catch or dual, self-aligning, permanent magnet catch. Provide 2 catches on doors more than 48 inches (1220 mm) high.
- E. Drawer Slides: Zinc-plated, metal-channel, self-closing drawer slides, designed to prevent rebound when drawers are closed, with nylon-tired, ball-bearing rollers, and complying with BHMA A156.9, Type B05091, and rated for the following loads:
  - 1. Box Drawer Slides: 100 lbf (440 N).
  - 2. File Drawer Slides: 200 lbf (890 N).
  - 3. Pencil Drawer Slides: 45 lbf (200 N).
  - 4. Keyboard Slide: 75 lbf (330 N).
  - 5. Trash Bin Slides: 200 lbf (890 N).
- F. Label Holders: Stainless steel, sized to receive standard label cards approximately 1 by 2 inches (25 by 51 mm), attached with screws or brads.
  - 1. Provide on drawers, where indicated on Drawings.
- G. Drawer and Cupboard Locks: Cylindrical (cam) type, 5-pin tumbler, brass with chrome-plated finish, complying with BHMA A156.11, Grade 1.

1. Provide a minimum of two keys per lock and six master keys.  
Provide locks on doors and drawers, where indicated on Drawings.
- H. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door units.
- I. Adjustable Shelf Supports: 2-pin locking plastic shelf rests complying with BHMA A156.9, Type B04013, unless otherwise indicated on Drawings.
- J. Adjustable Shelf Supports: Mortise-type, zinc-plated steel standards and shelf rests complying with BHMA A156.9, Types B04071 and B04091.
- K. Doors and Drawers:
  1. Provide "felt silencer" not more than 1/8 inch maximum thick.

## 2.7 COUNTERTOPS

- A. Countertops, General: Provide smooth, clean exposed tops and edges in uniform plane free of defects. Provide front and end overhang of 1 inch (25 mm) over base cabinets.
- B. Plastic-Laminate Tops: Plastic-laminate sheet, shop bonded with waterproof glue to both sides of 3/4-inch (19-mm) plywood or particleboard unless otherwise indicated.
  1. Plastic-Laminate Type for Flat Tops: Type -HGS.
  2. Plastic-Laminate Type for Formed Tops: Type -HGP.
  3. Plastic-Laminate Type for Backing: Type -BKL.
  4. Provide 3-mm PVC edging on front edge of top, on top edges of backsplashes and end splashes, and on ends of tops and splashes matching adjacent plastic-laminate surface colors.
  5. Construct top and backsplash from one piece "post-formed" of plastic laminate with rolled edges and coved intersection. Provide separate end splashes fitted to top.
  6. Use APA Marine-grade plywood for countertops containing sinks.
- C. Solid-Surfacing-Material Tops: Made from homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type -5 or Type -6, without a precoated finish.
- D. Counter Tops and Backsplashes (Plastic Laminate):
  1. Counter Tops – Perimeter edge-band with 1-1/2 inch thick plastic laminate over plywood core, thickness after lamination 1 inch. Shop fabricate tops using one-piece whenever possible and no transverse joints permitted with 24" of counter sinks.
    - a. Front edge-band shall be rounded 3mm PVC strip flush with top counter surface and rounded underside flush with bottom of counter top matching adjacent plastic-laminate surface colors.
  2. Exposed front corner edges of counter tops shall be rounded with 1/2" minimum and 1" maximum radius at corners when counter tops are not abutting walls.
    - a. Island type counter tops: Provide 1/2" minimum to 1" maximum radius at all corners.
  3. Backsplash and Ends: Provide 4" high backsplash unless otherwise noted, and ends on all counter units to match counter top for job site installation.

4. Contractor's Option: "Post-formed" backsplashes and countertop front nosings will be reviewed for acceptability.

## 2.8 WALL SHELVING

- A. Plastic-Laminate Shelving: Plastic-laminate sheet, Type HGL or HGP, shop bonded with waterproof glue to both sides of 3/4-inch (19-mm) particleboard, medium-density fiberboard or plywood.
  1. Shelf Thickness: 3/4 inch (19 mm) unless otherwise indicated.
  2. Edge Treatment: Finish both edges with plastic laminate that matches face surfaces.
- B. Adjustable Shelf Supports: Zinc-plated steel standards and shelf brackets, complying with BHMA A156.9, Types B04102 and B04112, surface mounted or mortise type.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of institutional casework.

### 3.2 CASEWORK INSTALLATION

- A. Install plumb, level, and true; shim as required, using concealed shims. Where institutional casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch (1.5 mm) of a single plane. Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced 24 inches (600 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch (1.5 mm).
  1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 24 inches (600 mm) o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than two fasteners.
- C. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch (1.5 mm) of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Align similar adjoining doors to a tolerance of 1/16 inch (1.5 mm).
  1. Fasten through back, near top and bottom, at ends, and not more than 16 inches (400 mm) o.c. directly to adequate structural supports.
  2. Provide support information and items to other affected trades for early installation to partition cavities.
- D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises. Adjust and align hardware so moving parts operate freely and contact points meet accurately.

- E. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

### 3.3 INSTALLATION OF TOPS

- A. 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 shown on Shop Drawings.
  - 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- B. Secure tops to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each front, end, and back.
- C. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- D. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and walls with adhesive.
- E. Seal junctures of top, splash, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

### 3.4 INSTALLATION OF SHELVING

- A. Securely fasten adjustable shelving supports to partition framing, wood blocking, or reinforcements in partitions.
- B. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

### 3.5 CLEANING AND PROTECTING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protection: Provide plastic or other suitable water-resistant covering over countertop surfaces. Remove protection at Substantial Completion.

END OF SECTION 12 3210

## SECTION 21 0500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.

## 1.2 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 09 9123 - Interior Painting: Preparation and painting of interior fire protection piping systems.
- C. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

## 1.3 REFERENCE STANDARDS

- A. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.
- B. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fuzing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications 2019.
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2015.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.
- E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250 2016.
- F. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).
- G. ASTM A536 - Standard Specification for Ductile Iron Castings 1984 (Reapproved 2019)e1.
- H. AWWA C606 - Grooved and Shouldered Joints 2015.
- I. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems 2019.
- K. UL (DIR) - Online Certifications Directory Current Edition.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
  - 1. NFPA 13 - Standard for the Installation of Sprinkler Systems
- B. Delegated Design: Engage a qualified Fire Protection professional engineer, as defined in Section 014000 "Quality Requirements," to design project sprinkler systems. Base calculations

on results of fire-hydrant flow test. Flow test shall be performed within one year of construction start.

- C. Hydraulic Design Criteria: Sprinkler system design shall be approved by authorities having jurisdiction, Owner's Insurance Underwriter (where applicable) and shall be designed according to the following:
1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers, or 10 psi, whichever is greater.
  2. Sprinkler Occupancy Hazard Classifications: Refer to Drawings.
  3. Minimum Density for Automatic-Sprinkler Piping Design: Refer to Drawings.
  4. Maximum Protection Area per Sprinkler: According to the latest NFPA 13 standard, UL listing and as specified on Drawings.
  5. Total Combined Hose-Stream Demand Requirement: According to latest NFPA 13 standard unless otherwise indicated on drawings.
  6. Water velocity in the piping system shall not exceed the following:
    - a. Underground mains: 16 ft/sec.
    - b. Aboveground mains: 32 ft/sec.
    - c. Sprinkler branch lines: 20 ft/sec.
  7. Water supply noted on the drawings. If not, Contractor shall make flow test to ascertain water flow.

## 1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Delegated-Design Submittal: For all sprinkler systems 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. Shop Drawings and Hydraulic Calculations:
    - a. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals.
    - b. Indicate installation, layout, weights, mounting and support details, and piping connections.
    - c. Layout and name (or number) of each room repeated as shown on the Architect's/Engineer's plans.
    - d. Reflected ceiling plan for each area showing location of partition walls, ceiling grid lines, ceiling light fixtures; proposed location of all fire sprinler heads; and size and



location of all piping. Shop drawings shall clearly identify any areas proposed to be protected with "dry type" systems and "anti-freeze type" systems and shall identify sprinkler heads rated for discharge at temperatures other than 165 degrees F.

- e. Shop drawings shall be submitted to the Architect/Engineer, AHJ and Owner's Insurance Underwriter (where applicable) for review and approval.

C. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each fire-department or pump test header connection.
3. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable Victaulic style number.

- D. Shop Drawings, Product Data and Hydraulic calculations shall be reviewed as one package; review of submittals shall not start until Engineer has all product data, hydraulic calculations and shop drawings.

## 1.6 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Provide fire protection work per the mandatory code requirements, standards of NFPA, and the requirements of the Owner's Insurance Underwriter, where applicable, except where more stringent requirements are indicated, as modified and supplemented by the Contract Documents. The NFPA requirements include the appendices and supplements.
2. The provisions and recommendations of the NFPA constitute mandatory minimum requirements for work specified herein. No payment will be made by the Owner for extra charges for work added in order to comply with NFPA Standards and Owner's Insurance Underwriter requirements, where applicable.

- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

- C. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

1. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified Fire Protection engineer.

- D. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

- E. Comply with UL (DIR) requirements.

- F. Valves: Bear UL (DIR) product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- G. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.
- H. Pipe: Each length of pipe shall be legibly identified at mill by paint, stenciling or raised symbols identifying manufacturer and class type or schedule of pipe. Copper pipe shall be identified at 3 foot intervals.
- I. Fittings: To be identified by manufacturer by permanently attached tags, imprints or other approved means indicating class of wall thickened and material.

#### 1.7 DEVIATIONS FROM BASIS OF DESIGN MANUFACTURER

- A. Should the Division 21 Contractors submit equipment by a Manufacturer other than that indicated as the Basis of Design on the Drawings, Contractor shall then be responsible for evaluating the impacts of the proposed Manufacturer's equipment, even if the Manufacturer is listed in the specifications as an approved equal. This includes the proposed Manufacturer's electrical, architectural and structural requirements and their subsequent impacts on the current design (roof openings, curbs, structural support, etc.) and coordination of any differing dimensions and clearances with all other trades.

#### 1.8 FIELD CONDITIONS - RENOVATION PROJECTS

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
  - 1. Notify Architect & Construction Manager no fewer than five days in advance of proposed interruption of sprinkler service.
  - 2. Do not proceed with interruption of sprinkler service without Architect's and Construction Manager's written permission.

#### 1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

### PART 2 PRODUCTS

#### 2.1 FIRE PROTECTION SYSTEMS

- A. Sprinkler Systems: Comply with NFPA 13.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

#### 2.2 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A53 Schedule 40 or ASTM A135/A135M Schedule 10, black.
1. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
  2. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
  3. Ductile iron Fittings: ASTM A536, Grade 65-45-12. In applicable sizes, fittings shall be short pattern, with flow equal to standard pattern fittings.
    - a. Basis of Design: Victaulic FireLock.
  4. Mechanical Grooved Couplings: Two ductile iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, ASTM A449 compliant steel bolts, nuts; galvanized for galvanized pipe.
    - a. Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with NFPA-13, fully installed at visual pad-to-pad offset contact. Couplings that require exact gapping at specific torque ratings are not permitted.
      - 1) Installation-Ready for complete installation without field disassembly.
      - 2) Basis of Design: Victaulic Style 009N and 107N.
    - b. Flexible Type: For use in locations where vibration attenuation and stress relief are required.
      - 1) Basis of Design: Victaulic Installation-Ready Style 177 or Style 77.
    - c. Installation-Ready gaskets are center-leg, with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth.
  5. Installation-Ready fittings for Schedule 40 & 10 grooved end steel piping in fire protection applications sizes NPS 1-¼ thru 2½ (DN 32 thru DN 65). Fittings shall consist of a ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready ends, orange enamel coated, red enamel coated or galvanized. Fittings complete with prelubricated Grade "E" EPDM Type 'A' gasket; and ASTM A449 electroplated steel bolts and nuts. System shall be UL listed for a working pressure of 300 psi (2065 kPa) and FM approved for working pressure 365 psi (2517kPa).
  6. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

## 2.3 PIPE SLEEVES

- A. Vertical Piping:
1. Sleeve Length: 1 inch above finished floor.
  2. Provide sealant for watertight joint.

- B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
  - 1. Zinc coated or cast iron pipe.
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Quarry Tile, Terrazzo, or Ceramic Tile Floors:
  - 1. Brass pipe.
  - 2. Connect sleeve with floor plate.
- E. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.
- F. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.
- G. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
  - 3. Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

## 2.4 ESCUTCHEONS

- A. Material:
  - 1. Metals and Finish: Comply with ASME A112.18.1.
- B. Construction:
  - 1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
  - 2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

## 2.5 PIPE HANGERS AND SUPPORTS

- A. Supporting Elements: provide UL/FM components per NFPA 13, ANSI B 31.1 and MSS SP-58 except that "C" clamps or any modification thereof are unacceptable.
  - 1. "C" clamps: With set screw, locknut and restraining strap are acceptable for piping up to 2-1/2".
- B. Furnish necessary piping and equipment supporting elements including; building structure attachments; supplementary steel; hanger rods, stanchions and fixtures; vertical pipe attachments; horizontal pipe attachments; anchors; guides.
- C. Center Loading Beam Clamps: For attachments to building structure as approved except piping supported from top of steel.

## 2.6 MECHANICAL COUPLINGS

- A. Manufacturers:
  - 1. Tyco Fire Protection Products: [www.tyco-fire.com/#sle](http://www.tyco-fire.com/#sle).
  - 2. Victaulic Company: [www.victaulic.com/#sle](http://www.victaulic.com/#sle).
  - 3. Anvil/Gruvlok: [www.anvilintl.com](http://www.anvilintl.com)
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Rigid Mechanical Couplings for Grooved Joints:
  - 1. Dimensions and Testing: Comply with AWWA C606.
  - 2. Minimum Working Pressure: 300 psig.
  - 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
  - 4. Gasket Material: EPDM-HP suitable for operating temperature range from minus 30 degrees F to 250 degrees F.
  - 5. Bolts and Nuts: Hot dipped galvanized or zinc electroplated steel.
- C. Only use grooved coupling as permitted by NFPA 13 and NFPA 14.

## PART 3 EXECUTION

### 3.1 FIRE SUPPRESSION PIPING APPLICATIONS

- A. Standard-pressure, wet-pipe sprinkler system, NPS 2 (DN 50) and smaller, shall 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 roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
  - 3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

- B. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 (DN 65) and larger, shall be one of the following:
1. Schedule 40, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
  2. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
  3. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
  4. Schedule 10, black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.
  5. Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.
- C. High-pressure, wet-pipe sprinkler system, shall be one of the following:
1. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

### 3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.

### 3.3 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  2. Place hangers within 12 inches of each horizontal elbow.
  3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  6. Provide copper plated hangers and supports for copper piping.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- I. Structural Considerations:
1. Do not penetrate building structural members unless indicated.
- J. Provide sleeves when penetrating footings, floors, and walls. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- K. Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  5. Tighten bolting for a water-tight seal.
  6. Install in accordance with manufacturer's recommendations.
- L. Escutcheons:
1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
  2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
  3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

- N. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.
- O. Where pipes are in partitions, furred out spaces and chases, obtain information as to their exact location and size and install work so as to be entirely concealed in allotted space. If conflicts arise making this impossible, obtain instructions from Architect before proceeding with work.
- P. Where there is evidence that parts of fire protection work will interfere with other work, assist in working out space conditions and/or structure, make necessary adjustments to accommodate work.
- Q. Fire protection work installed before coordinating with other work so as to cause interference with other work to be changed to correct such condition without additional cost to Owner.
- R. Accessibility:
1. Install fire protection work to permit removal (without damage to other parts) of coils, heat exchangers, pumps, fan shafts and wheels, belt guards, sheaves and drives and other parts requiring periodic replacement or maintenance.
  2. Arrange pipes and equipment to permit ready access to valves, cocks, traps, starters, motors, dampers, control components and to clear openings of swinging and overhead doors and of access panels.
- S. When necessary to install "U"-shaped dip in a pipe due to a conflict with duct work or other building components, Contractor shall install a  $\frac{3}{4}$ " diameter hose nipple and cap pointing down at lowest point in pipe dip. Contractor shall try to arrange piping layout to avoid such dips; no such dip shall be installed without prior approval of Engineer. All such conditions shall be clearly located and noted on record drawings given to Owner.
- T. When necessary to install inverted "U" in branch piping to rise above an obstruction, Contractor shall install an upright  $\frac{3}{4}$ " diameter air vent nipple and cap at high point of inverted "U". Contractor shall try to arrange piping layout to avoid such high points; no such installation shall be made without approval of Engineer. All such conditions shall be clearly located and noted on record drawings given to Owner.
- U. Contractor shall provide Owner with at least 24 hours prior notice before commencing sprinkler installations. Owner shall be responsible for deactivating building alarm system and notifying local fire department or other agencies. Under no circumstances shall Contractor attempt to deactivate building alarm system or circumvent any valve tamper switch. Contractor shall perform all work during normal business hours. By the end of each working day, Contractor shall cap all pipe ends.



- V. Pressure test completed work in progress, repair any leaks and otherwise make the sprinkler system water tight so that fire alarm and sprinkler protection system can be reactivated by Owner during non-business hours.

### 3.4 SOUND CONTROL

- A. Penetrations shall be maintained airtight to prevent sound transfer.
- B. Piping shall pass through sleeves. Pack sleeves tight with glass fiber or oakum and caulked on both sides with non-hardening acoustical sealant.

### 3.5 CLEANING

- A. Flush entire piping system of foreign matter in accordance with NFPA 13.
- B. Upon completion of work, clean all parts of the installation.
- C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

### 3.6 TESTING AND ACCEPTANCE

- A. After completing branch system, Contractor shall test fire sprinkler piping hydrostatically for a period of two hours at not less than 200 psi or at 50 psi in excess of the maximum operating static pressure when the maximum static pressure exceeds 150 psi. Contractor shall check system for leakage of joints and measure hydrostatic pressure at low point of each system or zone being tested.
- B. The Contractor shall repair or replace piping and fittings as required to eliminate leakage (in accordance with NFPA standards for "little or no leakage") and retest as specified to demonstrate compliance.
- C. Upon satisfactory completion and testing of branch piping system, Contractor shall provide Owner with a letter certifying that branch piping system has been completed in accordance with NFPA 13 and is operational, complete and has no defects.
- D. Test shall be witnessed by Architect/Owner and any authorities having jurisdiction who may so require.

END OF SECTION

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## SECTION 21 1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

#### 1.2 RELATED REQUIREMENTS

- A. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.

#### 1.3 REFERENCE STANDARDS

- A. ITS (DIR) - Directory of Listed Products current edition.
- B. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL (DIR) - Online Certifications Directory Current Edition.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or Model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
  - 3. Sprinkler Wrenches: For each sprinkler type.
- E. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

#### 1.5 QUALITY ASSURANCE

- A. Comply with UL (DIR) requirements.
- B. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

- C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- D. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
  - 1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
  - 1. Tyco Fire Protection Products: [www.tyco-fire.com/#sle](http://www.tyco-fire.com/#sle).
  - 2. Victaulic Company: [www.victaulic.com](http://www.victaulic.com)
  - 3. Viking Corporation: [www.vikinggroupinc.com/#sle](http://www.vikinggroupinc.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

### 2.2 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for building areas noted.
- B. Water Supply: Determine volume and pressure from water flow test data.
- C. Interface system with building fire and smoke alarm system.

### 2.3 SPRINKLERS

- A. Sprinklers shall be glass bulb type, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation.
  - 1. Wrenches shall be provided by the sprinkler manufacturer that directly engage the hex-shaped wrench boss integrally cast in the sprinkler body.
- B. Suspended Ceiling Type: concealed, exposed or semi-recessed to match existing pendant type with matching push on escutcheon plate.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard.
  - 3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
    - a. Basis of Design: Victaulic Model V38.
- C. Flexible Drop System: Stainless steel, multiple use, open gate type.
  - 1. Application: Use to properly locate sprinkler heads.
  - 2. Include all supports and bracing.

3. Provide braided type tube as required for the application.
4. The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel Male threaded nipple or Victaulic FireLock IGS Groove Style 108 coupling for connection to branch-line piping, and a zinc plated steel reducer with a female thread for connection to the sprinkler head.
5. The drop shall include a UL approved Series AH1 with 3" bend radius; AH2 or AH2-CC braided hose with a bend radius to 2" to allow for proper installation in confined spaces.
6. The flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 or AB2 bracket. The bracket shall allow installation before the ceiling tile is in place.
7. Manufacturers:
  - a. Victaulic Company; Victaulic VicFlex™ Multiple-Use Flexible Stainless Steel Sprinkler Drop System [with captured coupling Style 108].
  - b. Substitutions: See Section 01 6000 - Product Requirements.
8. In lieu of rigid connections to dry sprinkler heads, a Victaulic VicFlex™ dry sprinkler, Model VS1, may be used. The sprinkler shall provide a vertical or horizontal flexible connection with a bend radius to 2", and allow for up to 4 bends
9. In lieu of rigid pipe offsets or return bends for sprinkler drops in wet, dry, and preaction systems in cold storage applications, the Victaulic VicFlex™ V33, V36, or V40 Dry Sprinkler with Integral AB6 Assembly may be used.
10. In lieu of threaded steel piping systems, the Victaulic FireLock IGS System with "Installation-Ready™ fittings and couplings may be used for NPS 1 (DN 25) Schedule 10 and Schedule 40 carbon steel pipe in fire protection applications. System rated for a working pressure to 365 psi (2517 kPa).
  - a. Groove: IGS "Innovative Groove System" groove with shortened "A" dimension and tapered groove backside for ease of installation.
  - b. Grooving Tool: Victaulic RG2100, with IGS Confirmation Gauge.
  - c. Victaulic V9 sprinkler heads may be used in direct substitution where applicable.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.
- E. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

- F. Do not install sprinklers that have been dropped, damaged, show a visible loss of fluid, or a cracked bulb.
- G. The sprinkler bulb protector shall be removable by hand, without tools or devices that may damage the bulb.
- H. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- I. Flush entire piping system of foreign matter.
- J. Hydrostatically test entire system.
- K. Require test be witnessed by Fire Marshal.

### 3.2 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

## SECTION 22 0005 - BASIC PLUMBING REQUIREMENTS

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. This section applies to all sections of Division 22.
- B. Drawings and general provisions of the contract, including Division 00 and Division 01 specification sections, apply to work of this section.
- C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
- D. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under item "A" above.

#### 1.2 APPLICATION

- A. This section applies to all plumbing work. The contractors involved shall check all sections of the specifications in addition to the particular section covering their specific trade. Each distinct section of the specifications aimed for one trade may have detailed information with regards to other trades, therefore, it is imperative that all sections be reviewed to get a complete picture of all other trades' functions and work required.
- B. The plumbing contractor is responsible for the installation and operation of the plumbing systems.
- C. The plumbing contractor is responsible for receiving, unloading and placement of all of the owner provided equipment.

#### 1.3 INSPECTION OF SITE

- A. Each Contractor shall visit the site prior to bid submission to determine all existing conditions that may affect his work and shall make appropriate allowances for such conditions in his bid. Failure to visit the site shall not be cause for a request for additional compensation later in the project during construction.
- B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.
- C. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- D. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner before proceeding.

#### 1.4 ALTERNATES AND SUBSTITUTIONS

- A. Refer to Division 01 - General Requirements for procedures to submit products by a Manufacturer that is not listed as approved equal in the Specifications.

#### 1.5 **DEVIATIONS FROM BASIS OF DESIGN MANUFACTURER**

- A. Products identified within the schedules and details are used as the basis of design for laying out and coordinating with other trades such as structural, architectural, and electrical. Should Division 22 Contractor submit products by a manufacturer other than that indicated as Basis of Design in the Drawings, Contractor shall then be responsible for evaluating the impacts of the proposed Manufacturer's equipment, even if the Manufacturer is listed in the specifications as an approved equal. This includes the proposed Manufacturer's electrical, architectural and structural requirements and their subsequent impacts on the current design and coordination of any differing dimensions and clearances with all other trades. This evaluation shall be included as part of the proposed product submittal.

#### 1.6 CODES, PERMITS AND FEES

- A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for plumbing work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations. Applicable publications listed in all sections of Division 22 shall be the latest issue, unless otherwise noted.
- B. Rules of local utility companies and municipalities shall be complied with. Check with the utility company and/or municipality supplying service to the installation and determine all devices including, but not limited to: meters, regulators, valves which will be required and include the cost of all such items in the proposal.
- C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

#### 1.7 WARRANTY AND GUARANTEE

- A. Contractor shall guarantee all work installed by him or his subcontractors to be free from defect in material and workmanship for a period of one year from date of final acceptance of the work, unless a longer period is stipulated under specific headings. Contractor shall repair or replace at no additional cost to the owner, any material or equipment developing defects and shall also make good any damage caused by such defects or the correction of defects. Repairs or replacements shall bear additional guarantee, as originally called for, dated from the final acceptance of the repair or replacement. This requirement shall be binding even though it will exceed product guarantees normally furnished by some manufacturers. Contractor shall submit his own and each equipment manufacturers written certificates, warranting that each item of equipment furnished complies with all requirements of the drawings and specifications. Note that guarantee shall run from date of final acceptance of the work, not from date of installation of a device or piece of equipment.

#### 1.8 SUBMITTALS

- A. Shop drawings and samples shall be submitted in compliance with the Conditions of the Contract and Division 1 General Requirements.
- B. Contractor shall provide submittals where items are referred to by symbolic designation on the drawings. All submittals shall bear the same designation (plumbing piping, plumbing fixtures, etc.). Refer to other sections of the electrical specifications for additional requirements.



- C. Shop Drawings: Each piece of equipment shall be identified by the number shown in the schedules and by specification article number pertaining to the item. Shop drawings shall as a minimum be 1/4" equals 1' 0" scale, and shall be newly prepared by the Contractor and not reproduced from the Architect's drawings. Layouts shall be made for all floor plans including all ductwork, piping, electrical distribution and other mechanical equipment. Layouts shall show clearances of piping, ducts, etc., above floor.
- D. Contractor shall obtain Engineer's approval on all the work before any equipment is purchased, or any work installed. Contractor shall also secure approval of the Governmental Authorities having jurisdiction on all equipment and on the layout of the complete system.
- E. The Engineer's review and approval of shop drawings is a gratuitous assistance and in no way does it relieve the Contractor from responsibility for errors or omissions which may exist on the shop drawings. Where such errors or omissions are discovered later, they must be made good by the Contractor, without any additional cost to the Owner, irrespective of any approval by the Engineer.
  - 1. The Contractor shall incorporate with his shop drawings, a letter indicating all deviations from the plans and/or specifications. If in the opinion of the Architect, the deviations are not equal, the Contractor will be required to furnish the item as specified and as indicated on the drawings.
  - 2. Record documents shall be submitted in compliance with the requirements of the Specifications.
- F. Engineer WILL NOT REVIEW:
  - 1. Submittals not specified.
  - 2. Submittals not reviewed by Contractor; including Contractor stamp with signature comments.
  - 3. Submittals made after work is delivered to site and/or installed.
  - 4. Submittal resubmissions unless resubmission is required by Architect/Engineer.
- G. Installation of any item that requires submittal approval by the engineer shall be installed at the contractor's risk. The contractor, at his cost, shall remove all work installed prior to approval of the submittal.
- H. The engineer will not be responsible for errors in quantities, or dimensions required to fit the job condition, details of fabrication to insure proper assembly at the job, or for errors resulting from errors in submittals.
- I. For underground piping, record dimensions and invert elevations of all piping, including all offsets, fittings, cathodic protection and accessories. Locate dimensions from benchmarks that will be preserved after construction is complete.

#### 1.9 RECORD DRAWINGS

- A. Refer to Division 01 - General Requirements for procedures. All literature shall be furnished in accordance with requirements listed in Division 01.

- B. Contractor shall provide the following record drawings as part of the Project closeout document process:
1. Contract Documents, specifications and submittals, indicating "As-Built" conditions and actual products selected for use.
  2. Product and Maintenance manuals for all equipment listed within this specification manual and in Contract Documents. Provide with parts lists as applicable.

#### 1.10 QUALITY ASSURANCE

A. Other referenced standards:

1. Comply with referenced standards, guidelines, data sheets from various associations, including NFPA, ANSI, ASTM, ASME, ASHRAE.

### PART 2 PRODUCTS

#### 2.1 SLEEVES AND ESCUTCHEONS

#### 2.2 DIELECTRIC UNIONS

- A. Dielectric unions shall be used to connect dissimilar metals (such as steel and copper) to prevent electrolytic action.
- B. Dielectric waterway fittings shall be a copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service.

#### 2.3 BUILDING ATTACHMENTS FOR PLUMBING WORK SUPPORTS

A. General Requirements:

1. Provide building attachments required for supporting plumbing work, suitably selected and installed for the loads applied with a minimum additional safety factor of 3.
2. Where specified attachments are not suitable for conditions, submit to Engineer for approval, proposal for alternate building attachments.
3. If specially designed building attachments are required, retain the services of a licenced structural engineer to design such building attachments.
4. Approved Manufacturers: Grinnell, or equivalent products by Michigan Hanger and B-Line.
5. Provide supplemental trapeze supports where necessary. Design trapeze to support all trades. Coordinate loads, and supports with all trades. Size trapeze for maximum deflection of 1/64 of the span.

B. Attachments to Structural Steel:

1. Support plumbing work from building structural steel where possible and approved. No welding or bolting to structural steel is permitted unless authorized by Architect. C-clamps are not permitted.
  - a. Center beam clamp - for loads over 120 lb.: Malleable center hung Grinnell Fig. 228.

- b. Side beam clamp with retaining clips - for loads up to 120 lb.

### PART 3 EXECUTION

#### 3.1 GENERAL

- A. Existing piping: when encountered during the course of work, protect, brace and support existing piping where required for proper execution of the work.
- B. Interruption of existing active piping: when the course of work makes shut-down of services unavoidable, the plumbing contractor shall schedule the shut-down at such time as approved by the owners representative, which will cause least interference with established operating routine.
- C. Arrange work accordingly, providing such fittings as duct transitions traps, valves and accessories necessary to complete all construction in an orderly fashion.
- D. Install all equipment in strict accordance all directions and recommendations furnished by the manufacturer.

#### 3.2 INTERPRETATION OF CONTRACT DOCUMENTS

- A. Should there be discrepancy or a question of intent, refer matter to Architect/Engineer for decision before ordering any equipment or materials or before starting any related work.
- B. Drawings and Specifications are to be taken together. Work specified and not shown or work shown and not specified shall be performed or furnished as though mentioned in both Specifications and Drawings. If there is discrepancy between Drawings and Specifications as to quantity or quality to be provided, the greater quantity or better quality shall be provided.
- C. Minor items and accessories or devices reasonably inferable as necessary to complete and proper installation and operation of any system shall be provided by Contractor for such system whether or not specifically called for by Specifications or Drawings.
- D. Architect/Engineer may change location of any equipment 5' and any piping, ductwork, conduit, etc. 10' in any direction without extra charge, provided such changes are made before installation.
- E. Locations of items not definitely fixed by dimensions are approximate only and exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to review and approval by Architect/Engineer.
- F. Follow drawings in laying out work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum headroom and space conditions at all points.
  - 1. Where headroom or space conditions appear inadequate, notify Architect or Owner's field representative before proceeding with installation.
  - 2. Pipe/duct rerouting and size changes shall be made at no additional cost to the Owner.
- G. Furnish advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit installation of other work without delay.

- H. Where there is evidence that parts of the Work specified in Divisions 21, 22, and 23 will interfere with other work, assist in working out space conditions to make satisfactory adjustments, revise and submit coordinated shop drawings.
- I. After review and without additional cost to the Owner, make minor modifications in the work as required by structural interferences, by interferences with work of other sections or for proper execution of the work.
- J. Work installed before coordinating with other work so as to cause interference with other work shall be changed and corrected without additional cost to the Owner.
- K. Drawings are diagrammatic in nature and are a graphic representation of requirements and shall be followed as closely as actual building construction will permit. All changes from the plans necessary to make the work conform to the building as constructed and to fit the work of other trades or to conform to rules of the Governmental Authorities having jurisdiction, NFPA, OSHA and the Owner's Insurance Underwriters, shall be made by the Contractor without extra cost to the Owner.
- L. The layout of the piping, ductwork, equipment, etc., as shown on the drawings shall be checked and exact locations shall be determined by the dimensions of the equipment approved and the Contractor shall obtain approval for the revised layout before the apparatus is installed. The Contractor shall field measure or consult existing record Architectural and Structural Drawings if available for all dimensions, locations of partitions, locations and sizes of structural supports, foundations, etc.
- M. Omission in the Drawings and/or Specifications of any items necessary for the proper completion or operation of the work outlined in this specification shall not relieve the Contractor from furnishing same without additional cost to the Owner.
- N. The Equipment Shop Drawings should be furnished to the installing Contractor by the purchasing Contractor before roughing in. Contractor shall not install any piping or ductwork for said equipment until he has received approved shop drawings for same.

### 3.3 ALTERATIONS IN PRESENT BUILDING AND SYSTEMS

- A. Contractor shall take particular note of the revisions and alterations to the existing systems, facilities and equipment due to the new construction as indicated on the Drawings and/or in Specification. Contractor shall remove, reroute or alter all services, ductwork, etc., as required or as indicated on the drawings.
- B. The Contractor shall maintain all services in the existing building. In case, where new service connections are to be made to existing services and service interruptions can in no way be avoided, the service interruptions shall be with the minimum of inconvenience to the Owner and the work shall be done at such time of any day, Saturday and Sunday included, and only as directed by the Owner or the Architect.

### 3.4 ACCESSIBILITY

- A. Do not locate traps, valves, controls, unions, cleanouts, etc. in any system at a location that will be inaccessible after construction is completed. Maintain accessibility for all components in plumbing systems.

### 3.5 ACCESS PANELS:

- A. Refer to Division 08 - Openings; Provide access doors in locations as required by applicable codes and as indicated below. Coordinate locations with architectural trades.
- B. Submit shop drawings for review before ordering panels. Where fire rating is required, furnish label doors compatible with fire rating of assembly.
- C. Contractor shall confer with other trades with respect to access panel locations, and shall wherever practical group valves, traps, dampers, etc. in such way as to be accessible from single panel and eliminate as many access panels as possible.
- D. Furnish access panels to access valves, traps, control valves or devices, dampers, damper motors, etc. Access panels shall be sized as necessary for ample access, or as indicated on drawings, but no smaller than 12" x 12" where devices are within easy reach of operator, and at least 24"x24" when operator must pass through opening in order to reach the devices. Architectural Trades shall install access panels coordinated with Mechanical Trades.
- E. Access panels in fire rated walls or ceiling must be U.L. labeled for intended use. Unless otherwise indicated on plans, access doors shall be hinged flush type steel framed panel, 14 gauge minimum for frame, and with anchor straps. Only narrow border shall be exposed. Hinges shall be concealed type. Locking device shall be flush type and screw driver operated. Metal surfaces shall be prime coated with rust-inhibitive paint. Panels shall be compatible with architectural adjacent materials.

### 3.6 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

- A. Refer to Division 01 - General Requirements.
- B. All cutting required shall be done by the contractor whose work is involved, without extra cost the owner. All patching and restoration including the furnishing and installation of access panels in ceiling, walls; etc. Within the building lines shall be done by the respective, responsible contractor. No cutting of structural steel, concrete, or wood shall be done without prior approval and explicit directions of the architect patched by the respective, responsible contractor.
- C. The contractor, under whose jurisdiction the work may fall, shall provide labor, material, and tools required to cut, repair, protect, cap, or relocate existing pipes, conduits, or utilities interfering with or uncovered during work, per regulations of the authorities having jurisdiction.

### 3.7 EXCAVATION AND BACKFILLING

- A. Provide all excavation, trenching, tunneling, removal of materials, de-watering and backfilling required for the proper laying of pipes and plumbing work. Coordinate the work with other excavating and backfilling in same area.

### 3.8 ROUGH-IN FOR CONNECTION TO EQUIPMENT

- A. It shall be the responsibility of each contractor to study the architectural, structural, electrical, and mechanical drawings, conferring with the various trades involved and checking with the supplier of equipment in order to properly rough-in for all equipment.

### 3.9 MATERIAL AND EQUIPMENT

- A. All material and equipment shall be new and of the best quality used for the purpose in good commercial practice, and shall be the standard product of reputable manufacturers. The material and equipment must meet approval of state and local codes in the area it is being used. Roof decks shall not be used to support piping, conduit, equipment, devices, etc.

### 3.10 SEAL PENETRATIONS

- A. Seal the space around pipes in sleeves and around duct openings through walls, floors and ceilings. Provide adequate clearance to allow for proper sealing.

### 3.11 SOUND CONTROL

- A. Penetrations shall be maintained airtight to prevent sound transfer.
- B. Piping shall pass through sleeves. Pack sleeves tight with glass fiber or oakum and caulked on both sides with non-hardening acoustical sealant.

### 3.12 FIRESTOPPING

- A. Refer to Division 07 - Thermal and Moisture Protection for more information.
- B. Provide UL classified firestopping system for plumbing penetrations through rated walls and floors to maintain the fire rating.

### 3.13 CLEANING, FLUSHING, AND INSPECTING

- A. Refer to Division 01 - General Requirements; all plumbing equipment and components shall be cleaned as frequently as necessary through the construction process and again prior to project completion.
- B. Clean exterior surfaces of installed piping systems of superfluous materials and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
- C. Sufficient flushing water shall be introduced into the mains to produce a velocity of not less than 4' per second and this flow rate shall be continued until the discharge is clean and clear and does not show evidences of silt or foreign matter when a sample is visually inspected.
- D. Inspect pressure piping in accordance with procedures of ASME B31.

### 3.14 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT AND MATERIALS

- A. Refer to Division 01 - General Requirements; all equipment and materials shall be delivered, stored and secured per manufacturer's recommendations.
- B. On-site storage shall be coordinated with Construction Manager/General Contractor and be performed in a manner as to avoid damage, deterioration and loss.
- C. Contractor shall provide temporary protection for installed equipment prior to project completion.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

- E. All equipment shall be inspected prior to installation to assure that equipment is free from defect and damage.
- F. Protect plumbing fixtures and piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### 3.15 PIPING TESTS

- A. Test pressure piping in accordance with ASME B31.
- B. General: Provide temporary equipment for testing, including pump and gauges. Test piping systems before insulation is installed wherever feasible and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.
  - 1. Test each piping system at 150% of operating pressure, or other pressure as required by Authority Having Jurisdiction, whichever is greater.
    - a. Domestic water systems and equipment vents shall be tested hydrostatically for minimum of four hours at 1½ times design pressure for that system, or 100 psig minimum, whichever is greater, unless otherwise specified.
  - 2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- C. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics or other temporary repair methods.
- D. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION

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## SECTION 22 0505 - SELECTIVE DEMOLITION FOR PLUMBING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Demolition and extension of existing plumbing work.

#### 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, repairs.

#### 1.3 SUMMARY

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the system of minor electrical demolition as described in this specification.
- B. The demolition documents plans and specification have been prepared from existing non-as built documents and cursory non-invasive field investigation.
- C. It is the contractors obligation to become familiar with the extent of demolition and the existing condition before submitting their bid.
- D. During demolition if the contractor discovers unforeseen significant non-code compliance conditions of the existing installation they shall notify the Architect and Engineer immediately in writing.
- E. The contractor shall become familiar with the drawings and scope of work of other trades as the work scope of those trades relates to mechanical equipment and connection requirements.
- F. During demolition the contractor shall record on site as-builts all plumbing sanitary, waste and domestic hot, cold and hot water recirculation capped branches for reuse in renovated project space.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- A. Materials and equipment for patching and extending work: As specified in individual sections.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that piping to be demolished serve only equipment and facilities within the demolition areas.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Owner before disturbing existing installation.

- D. Beginning of demolition means installer accepts existing conditions.

### 3.2 PREPARATION

- A. Identify locations for capping plumbing piping before any demolition work commences.
- B. Coordinate utility service shut-downs with Utility Companies.
- C. Provide temporary connections to maintain existing systems in service during construction.
- D. Confirm isolation valve locations for domestic water piping. Repair leaking isolation valves or replace inoperable valves before commencing piping demolition.

### 3.3 DEMOLITION AND EXTENSION OF EXISTING PLUMBING WORK

- A. In general plumbing remodeling work is shown on Drawings but carefully study all drawings for all contracts for "demolition" and "remodeling" work in existing building and field check to verify locations where such work is being done to determine exact extent of work required. No extra will be allowed for additional work required because of demolition or remodeling whether or not work is specifically noted, itemized or shown on Drawings.
- B. Remove existing equipment and materials pertaining to contract as specified or as required, whether shown on Drawings or not, to prepare for new work of all contracts.
- C. Where necessary, reroute piping, ducts, etc. from within walls, floors, ceilings, etc. being removed. Contractor involved with interrupted service shall be responsible for accomplishing required work whether shown on Drawings or not.
- D. Remove, relocate, and extend existing plumbing piping to accommodate new construction.
- E. Remove domestic water piping back to main and provide isolation valve and cap. DEAD LEGS ARE NOT ALLOWED.
- F. Remove sanitary and waste piping to branch connection fitting to negate any dead legs.

### 3.4 CLEANING AND REPAIR

- A. Refer to Division 01 - General Requirements for procedures.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION

## SECTION 22 1005 - PLUMBING PIPING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Condensate drains.
  - 4. Flanges, unions, and couplings.
  - 5. Pipe hangers and supports.

#### 1.2 RELATED REQUIREMENTS

- A. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.
- B. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- C. Section 22 0719 - Plumbing Piping Insulation.

#### 1.3 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- C. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV 2016.
- D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV 2017.
- E. ASME B31.9 - Building Services Piping 2020.
- F. ASTM B32 - Standard Specification for Solder Metal 2020.
- G. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.
- H. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- J. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV) 2020.
- K. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- L. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.

- M. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- N. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.
- O. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.
- P. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2020.
- Q. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2017.
- R. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast 2017, with Errata (2018).
- S. AWWA C651 - Disinfecting Water Mains 2014.
- T. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications 2017 (Revised 2018).
- U. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2012 (Revised 2018).
- V. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- W. NSF 61 - Drinking Water System Components - Health Effects 2020.
- X. NSF 372 - Drinking Water System Components - Lead Content 2020.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
  - 1. Grooved joint couplings and fittings shall be referred to on drawings and product submittals, and be identified by the manufacturer's listed model or series designation.

#### 1.5 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.
- C. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### 1.7 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

### PART 2 PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

#### 2.2 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  1. Fittings: Cast iron.
  2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. Copper Tube: ASTM B306, DWV.
  1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, solvent.
  2. Joints: ASTM B32, alloy Sn50 solder.
- C. PVC Pipe: Schedule 40 Solid Wall ASTM D2665.
  1. Fittings: PVC.
  2. Joints: Solvent welded, with ASTM D2564 solvent cement.

#### 2.3 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
  1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
- B. Ductile Iron Pipe: AWWA C151/A21.51.
  1. Fittings: Ductile iron, standard thickness.
  2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch diameter rods.

## 2.4 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A) or L (B) for mains and Type L (B) for branch piping, Drawn (H). Type M (C) will not be accepted.
1. Fittings:
    - a. ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
    - b. Grooved end fittings manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.)
  2. Joints:
    - a. ASTM B32, solder.
    - b. Grooved joint coupling consisting of two ductile iron housings cast with offsetting angle-pattern bolt pads, Fluoroelastomer center-leg gasket with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth, and ASTM A449 compliant bolts and nuts. Installation ready rigid coupling for direct stab installation without field disassembly.
      - 1) UL classified in accordance with NSF-61 for potable water service. The system shall meet the low-lead requirements of NSF-372.
  3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.
    - a. Manufacturers:
      - 1) Apollo Valves: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
      - 2) Viega LLC: [www.viega.us/#sle](http://www.viega.us/#sle).
      - 3) Nibco: [www.nibco.com](http://www.nibco.com).
      - 4) Substitutions: See Section 01 6000 - Product Requirements.

## 2.5 CONDENSATE DRAINS SERVING INDIVIDUAL EQUIPMENT

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn; using one of the following joint types:
1. Solder joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

## 2.6 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
1. Ferrous Pipe: Class 150 malleable iron threaded unions.
  2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
  2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.
- D. No-Hub Couplings:
1. General: Comply with ASTM C1277 and CISPI 310.
  2. Gasket Material: Neoprene complying with ASTM C564.
  3. Band Material: Stainless steel complying with ASTM A240.
  4. Eyelet Material: Stainless steel.
  5. Manufacturers:
    - a. MIFAB, Inc: [www.mifab.com/#sle](http://www.mifab.com/#sle).
    - b. Anaco-Husky: [www.anaco-husky.com](http://www.anaco-husky.com).
    - c. Substitutions: See Section 01 6000 - Product Requirements.
- E. Dielectric Connections:
1. Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
  2. Waterway Fitting: Copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service. Fittings shall have threaded ends, grooved ends, or a combination.

## 2.7 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges, grooved joint couplings, or unions.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions. Cast iron soil pipe installed in accordance to CISPI's Handbook.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access door with Division 01.
- I. Establish elevations of buried piping outside the building to ensure not less than 4 ft of cover.
- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 0523.
- L. Install water piping to ASME B31.9.
- M. Slope water piping and arrange to drain at low points.
- N. Install sub-soil drainage piping (perforated) from lowest end of slope to highest, solidly bedded in filtering or drainage fill. Shape bed for bells of piping (if any). Place bells/hubs and groove end of units up-stream. Lay perforated pipe with perforations down.
- O. Sub-soil drain pipe tube or tile shall be laid in trench with a minimum of 6" gravel on all sides. Provide filter sock and/or filter fabric on pipe.
- P. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- Q. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper



use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.

- R. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- S. Sleeve pipes passing through partitions, walls, and floors.
- T. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- U. In general, all piping, and similar items shall be installed concealed from view above ceiling, in partitions, shafts, chases, unless otherwise indicated.
- V. Where pipes are in partitions, furred out spaces and chases, obtain information as to their exact location and size and install work so as to be entirely concealed in allotted space. If conflicts arise making this impossible, obtain instructions from Architect/Engineer before proceeding with work.
- W. Where there is evidence that plumbing work will interfere with other work, assist in working out space conditions and/or structure, make necessary adjustments to accommodate work.
- X. Plumbing work installed before coordinating with other work so as to cause interference with other work to be changed to correct such condition without additional cost to Owner.
- Y. Appliances and equipment to be installed and connected with best engineering practices and in accordance with manufacturer's instructions and recommendations. Piping, valves, connections and other like items recommended by manufacturer or as required for proper operation to be provided without additional cost to Owner.
- Z. In no case will any pipe, conduit or duct be installed where it is supported on or suspended from another pipe, conduit or duct.

### 3.3 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

### 3.4 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope; 1/4 inch per foot slope for piping serving low flow fixtures.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### 3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed, and clean.

- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### 3.6 SERVICE CONNECTIONS

- A. Provide new sanitary and storm sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new natural gas service. Coordinate incoming line size, meter location, regulator settings, etc. with Utility Company prior to the start of any work.
- C. Provide new water service complete with approved wye strainer, reduce pressure backflow preventer, and water meter with by-pass valves.
  - 1. Provide 18 gage, 0.0478-inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

END OF SECTION

## SECTION 22 4000 - PLUMBING FIXTURES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Sinks.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Owner-furnished fixtures.
- B. Section 22 1005 - Plumbing Piping.

#### 1.3 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- C. ASME A112.19.3 - Stainless Steel Plumbing Fixtures 2017, with Errata.
- D. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2017.
- E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material 2013.
- F. NEMA LD 3 - High-Pressure Decorative Laminates 2005.
- G. NSF 61 - Drinking Water System Components - Health Effects 2020.
- H. NSF 372 - Drinking Water System Components - Lead Content 2020.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Extra Faucet Washers: Two sets of each type and size.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.6 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for installation of plumbing systems.
- B. Perform work in accordance with local health department regulations.

2.3 SINKS

- A. Sink Manufacturers:
  - 1. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - 2. Elkay: [www.elkay.com](http://www.elkay.com).
  - 3. Just Manufacturing: [www.justmfg.com](http://www.justmfg.com)
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. General: ASME A112.19.3, stainless steel, self rimming and undercoated.
- C. Bowl Quantity and Size: Refer to Schedules.
- D. Faucet:
  - 1. Gooseneck faucet with ADA wristblade handles
  - 2. Flowrate: Refer to Schedules.
  - 3. Manufacturers:
    - a. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
    - b. Chicago Faucet: [www.chicagofaucets.com](http://www.chicagofaucets.com)
    - c. Delta Faucet: [www.deltafaucet.com](http://www.deltafaucet.com)
    - d. Substitutions: See Section 01 6000-Product Requirements.
- E. Accessories:
  - 1. Drain:
    - a. Removable basket strainer.

2. Sink P-trap shall be chrome plated cast brass adjustable ground joint swivel with cleanout, with 17- gauge seamless brass adjustable wall bend provided with deep bell flange. P-Trap to have 2" water seal and rough-in complete, adapter extensions are not allowed. P-Trap shall be certified by CSA or other recognized third-party testing authority and marked with manufacturer's name. No private label wholesale products will be allowed.
3. Screwdriver, Loose key stops.
4. Lavatory supply kits shall include chrome plated all brass stops with brass stems, no plastic stems. Kits shall have 12" chrome plated copper risers and shallow brass flange. Inlet shall be 1/2" compression and outlet shall be 3/8" compression. Supply kit shall be certified by recognized independent third-party testing authority, will be marked with the manufacturer's name and comply with the SDWA (Safe Drinking Water Act) "No Lead" restrictions of ANSI NSF 61, Sec. 9. No private label wholesale products will be allowed.
5. All exposed lavatory and sink trim on wheelchair accessible fixtures shall be covered with a seamless antimicrobial vinyl insulating outer shell. Material shall be flame retardant and fungal and bacterial resistant. Insulating kits shall include covers for, drain tailpiece, all P-Trap components, and hot/cold water supplies.
6. Install with point of use thermostatic mixing valve, where noted in Schedules or where fixture must be ADA compliant.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.
- C. Examine floors and substrates and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.
- D. Inspect fixtures and accessories that are to be removed and relocated. Damaged or blemished items shall be brought to Architect's/Engineer's attention before reinstalling.

#### 3.2 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

#### 3.3 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Install components level and plumb.
- C. Piping exposed to view shall be chrome plated.

#### 3.4 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Adjust or replace washers to prevent leaks at faucets and stops.

3.5 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

- A. Clean plumbing fixtures and equipment.

3.7 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

3.8 FEILD QUALITY CONTROL

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
- B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

END OF SECTION

## SECTION 23 0005 - BASIC HVAC REQUIREMENTS

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. This section applies to all sections of Division 23.
- B. Drawings and general provisions of the contract, including Division 00 and Division 01 specification sections, apply to work of this section.
- C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
- D. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under item "A" above.

#### 1.2 APPLICATION

- A. This section applies to all mechanical work. The contractors involved shall check all sections of the specifications in addition to the particular section covering their specific trade. Each distinct section of the specifications aimed for one trade may have detailed information with regards to other trades, therefore, it is imperative that all sections be reviewed to get a complete picture of all other trades' functions and work required.
- B. The mechanical contractor is responsible for the installation and operation of the hvac systems and temperature control systems.
- C. The mechanical contractor is responsible for receiving, unloading and placement of all of the owner provided equipment.

#### 1.3 INSPECTION OF SITE

- A. Visit the site, examine and verify the conditions under which the work must be conducted before submitting proposal.
- B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.

#### 1.4 ALTERNATES AND SUBSTITUTIONS

- A. Refer to Division 01 - General Requirements for procedures.

#### 1.5 DEVIATION FROM BASIS OF DESIGN MANUFACTURER

- A. Products identified within the schedules and details are used as the basis of design for laying out and coordinating with other trades such as structural, architectural, and electrical. Should the Division 23 Contractors submit equipment by a Manufacturer other than that indicated as the Basis of Design in the Drawings, Contractor shall then be responsible for evaluating the impacts of the proposed Manufacturer's equipment, even if the Manufacturer is listed in the specifications as an approved equal. This includes the proposed Manufacturer's electrical, architectural and structural requirements and their subsequent impacts on the current design (roof openings, curbs, structural support, etc.) and coordination of any differing dimensions and

clearances with all other trades.

## 1.6 MATERIALS

- A. Mechanical equipment is to be furnished with motors, electrical controls and protective devices, and integral operating devices which are normally included by the manufacturer or required by the Contract Documents.
- B. The Mechanical Trades shall provide all control wiring, 120 volts and less, for the equipment and devices furnished under Division 22, and 23 of these specifications, including all wiring devices, conduit, etc.
- C. Power wiring 120 volts and greater shall be by the Electrical Trades.

## 1.7 DRAWINGS

- A. The drawings are diagrammatic and show the general location and arrangement of all equipment, piping and related items. They shall be followed as closely as elements of the construction will permit.
- B. Examine the drawings of other trades and verify the conditions governing the work on the job site. The mechanical and electrical contractor shall check all documents including architectural, structural, plumbing, HVAC and electrical to avert possible installation conflicts. Arrange work accordingly, providing such fittings, traps, valves and accessories as may be required to meet such conditions.
- C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.
- D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.
- E. Do not scale drawings for measurements.
- F. Field verifications of actual existing conditions are required by the contractor since actual locations, distances, and levels will be governed by actual field conditions. All measurements shall be verified at the site.
- G. If during field verification, the contractor identifies that there may require substantial changes from the original plans, the contractor shall notify the architect for agreement on necessary adjustment before the installation is started
- H. Discrepancies shown between plans, or between plans and actual field conditions, or between plans and specifications shall promptly be brought to the attention of the Architect/Engineer for a decision.
- I. Drawings and specifications are intended to cover the completed installation of systems to function as described. The omission of the expressed reference to any item of labor and material necessary to comply with practice codes, ordinances, etc., shall not relieve the



contractor from providing such additional labor and material at no cost to Owner.

#### 1.8 CODES, PERMITS AND FEES

- A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for mechanical work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations. Applicable publications listed in all sections of Division 23 shall be the latest issue, unless otherwise noted.
- B. Rules of local utility companies and municipalities shall be complied with. Check with the utility company and/or municipality supplying service to the installation and determine all devices including, but not limited to: meters, regulators, valves which will be required and include the cost of all such items in the proposal.
- C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

#### 1.9 MAINTENANCE

- A. Provide 16 hours of instruction to the owner's designated personnel in the maintenance and operation of equipment and systems.
- B. Provide complete maintenance and operating instructional manuals covering all mechanical equipment herein specified, together with parts lists. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Four (4) copies of all literature shall be furnished for owner and shall be bound in book or ring binder form. Maintenance and operating instructional manuals shall be provided when construction is approximately 75% complete.

#### 1.10 WARRANTY AND GUARANTEE

- A. Contractor shall guarantee all work installed by themselves or their subcontractors to be free from defect in material and workmanship for a period of one year from date of final acceptance of the work, unless a longer period is stipulated under specific headings. Contractor shall repair or replace at no additional cost to the owner, any material or equipment developing defects and shall also make good any damage caused by such defects or the correction of defects. Repairs or replacements shall bear additional guarantee, as originally called for, dated from the final acceptance of the repair or replacement. This requirement shall be binding even though it will exceed product guarantees normally furnished by some manufacturers. Contractor shall submit his own and each equipment manufacturers written certificates, warranting that each item of equipment furnished complies with all requirements of the drawings and specifications. Note that guarantee shall run from date of final acceptance of the work, not from date of installation of a device or piece of equipment.

#### 1.11 SUBMITTALS

- A. Refer to Division 01 - General Requirements for procedures.
- B. Contractor shall provide submittals where items are referred to by symbolic designation on the drawings. All submittals shall bear the same designation (hvac equipment, piping equipment, etc.). Refer to other sections of the mechanical specifications for additional requirements.

- C. Engineer WILL NOT REVIEW:
1. Submittals not specified.
  2. Submittals not reviewed by Contractor, including Contractor stamp with signature comments.
  3. Submittals made after work is delivered to site and/or installed.
  4. Submittal resubmissions unless resubmission is required by Architect/Engineer.
- D. Types of submittals include the following:
1. Shop Drawings
  2. Product Data Sheets
  3. Samples
  4. Manufacturers Instructions
  5. Maintenance Data
  6. Warranty
- E. Installation of any item that requires submittal approval by the engineer shall be installed at the contractors risk. The contractor, at his cost, shall remove all work installed prior to approval of the submittal.
- F. The engineer will not be responsible for errors in quantities, or dimensions required to fit the job condition, details of fabrication to insure proper assembly at the job, or for errors resulting from mistakes in submittals.

#### 1.12 RECORD DRAWINGS

- A. Refer to Division 01 - General Requirements for procedures.
- B. Contractor shall provide the following record drawings as part of the Project closeout document process:
1. Contract Documents, specifications and submittals, indicating "As-Built" conditions and actual products selected for use.
  2. Product and Maintenance manuals for all equipment listed within this specification manual and in Contract Documents. Provide with parts lists as applicable.
- C. Record drawings shall be maintained by the contractor up to date as the project progresses.
- D. Recording all deviations from the contract documents, indicate exact locations of all buried services both inside and outside of the building; include concealed piping and equipment in the entire contract. Final record drawings shall reflect the as-built conditions.

#### 1.13 QUALITY ASSURANCE

- A. Other referenced standards:

1. Comply with referenced standards, guidelines, data sheets from various associations, including NFPA, ANSI, ASTM, ASME, ASHRAE

## PART 2 PRODUCTS

### 2.1 SLEEVES AND ESCUTCHEONS

- A. Provide sleeves wherever pipes pass through exterior wall, and floors. Sleeves shall be schedule 40 steel pipe cut to length. Sleeves shall terminate flush with walls, partitions and ceilings in finished areas. All sleeves through floor shall extend 2" above floor. Provide cast brass nickel-plated escutcheons with positive catches on each visible sleeve penetration. Sleeves are to be sealed at each installation with a 3M approved sealant. The space between the inside of the sleeve and the outside of the pipe or conduit within the sleeve shall be sealed at each installation with a 3M approved sealant.

### 2.2 DIELECTRIC UNIONS

- A. Dielectric unions shall be used to connect dissimilar metals (such as steel and copper) to prevent electrolytic action.

### 2.3 FILTERS

- A. Provide and maintain filters in air handling systems throughout the construction period and prior to final acceptance of the building. Do not run air handling equipment without all prefilters and final filters as specified. Immediately prior to final building acceptance by the owner, contractor shall replace all disposable type air filters with new.

### 2.4 BUILDING ATTACHMENTS FOR MECHANICAL WORK SUPPORTS

#### A. General Requirements:

1. Provide building attachments required for supporting mechanical work, suitably selected and installed for the loads applied with a minimum additional safety factor of 3.
2. Where specified attachments are not suitable for conditions, submit to Engineer for approval, proposal for alternate building attachments.
3. If specially designed building attachments are required, retain the services of a licensed structural engineer to design such building attachments.
4. Approved Manufacturers: Grinnell, or equivalent products by Michigan Hanger and B-Line.
5. Provide supplemental trapeze supports where necessary. Design trapeze to support all trades. Coordinate loads, and supports with all trades. Size trapeze for maximum deflection of 1/64 of the span.

#### B. Attachments to Structural Steel:

1. Support mechanical work from building structural steel where possible and approved. No welding or bolting to structural steel is permitted unless authorized by Architect. C-clamps are not permitted.
  - a. Center beam clamp - for loads over 120 lb.: Malleable center hung Grinnell Fig. 228.

b. Side beam clamp with retaining clips - for loads up to 120 lb.

C. Drilled Insert Anchors:

1. Where mechanical work cannot be supported from structural steel, or cast in place concrete inserts, provide drilled concrete insert anchors. Submit for approval, project specific installation drawings for all loads over 100 lbs. Install inserts in web of beam if possible and approved. Insert depth shall not exceed two thirds the thickness of the concrete. Where existing concrete appears to be deteriorating, or where applied load at insert exceeds 1000 lbs., conduct test of concrete to determine derated capacity of insert. Anchors may be adhesive or expansion type up to 1000 lbs., and shall be adhesive type for loads over 1000 lbs.

2. Manufacturers: Hilti

### PART 3 EXECUTION

#### 3.1 GENERAL

- A. Existing piping and ductwork: when encountered during the course of work, protect, brace and support existing piping and ductwork where required for proper execution of the work.
- B. Interruption of existing active piping and ductwork: when the course of work makes shut-down of services unavoidable, the mechanical contractor shall schedule the shut-down at such time as approved by the owners representative, which will cause least interference with established operating routine.
- C. Arrange work accordingly, providing such fittings as duct transitions traps, valves and accessories necessary to complete all construction in an orderly fashion.
- D. Install all equipment in strict accordance all directions and recommendations furnished by the manufacturer.

#### 3.2 ACCESSIBILITY

- A. Do not locate valves, traps, controls, unions, dampers, etc. in any system at a location that will be inaccessible after construction is completed. Maintain accessibility for all components in mechanical, electrical, and plumbing systems.

#### 3.3 ACCESS DOORS AND PANELS

- A. Refer to Division 08 - Openings; Provide access doors in locations as required by applicable codes and as indicated below. Coordinate locations with architectural trades.
- B. Furnish access panels to access valves, traps, control valves or devices, dampers, damper motors, etc. Access panels shall be sized as necessary for ample access, or as indicated on drawings, but no smaller than 12" x 12" where devices are within easy reach of operator, and at least 24"x24" when operator must pass through opening in order to reach the devices. Architectural Trades shall install access panels coordinated with Mechanical Trades.
- C. Access panels in fire rated walls or ceiling must be U.L. labeled for intended use. Unless otherwise indicated on plans, access doors shall be hinged flush type steel framed panel, 14 gauge minimum for frame, and with anchor straps. Only narrow border shall be exposed.

Hinges shall be concealed type. Locking device shall be flush type and screw driver operated. Metal surfaces shall be prime coated with rust-inhibitive paint. Panels shall be compatible with architectural adjacent materials Manufacturer: Milcor, Bilco.

#### 3.4 CUTTING AND PATCHING

- A. Refer to Division 01 - General Requirements and Division 02 - Existing Conditions.
- B. All cutting required shall be done by the contractor whose work is involved, without extra cost the owner. All patching and restoration including the furnishing and installation of access panels in ceiling, walls; etc. Within the building lines shall be done by the respective, responsible contractor. No cutting of structural steel, concrete, or wood shall be done without prior approval and explicit directions of the architect patched by the respective, responsible contractor.
- C. The contractor, under whose jurisdiction the work may fall, shall provide labor, material, and tools required to cut, repair, protect, cap, or relocate existing pipes, conduits, or utilities interfering with or uncovered during work, per regulations of the authorities having jurisdiction.

#### 3.5 ROUGH-IN FOR CONNECTION TO EQUIPMENT

- A. It shall be the responsibility of each contractor to study the architectural, structural, electrical, and mechanical drawings, conferring with the various trades involved and checking with the supplier of equipment in order to properly rough-in for all equipment.

#### 3.6 MATERIAL AND EQUIPMENT

- A. All material and equipment shall be new and of the best quality used for the purpose in good commercial practice, and shall be the standard product of reputable manufacturers. The material and equipment must meet approval of state and local codes in the area it is being used. Roof decks shall not be used to support piping, conduit, equipment, devices, etc.

#### 3.7 SEAL PENETRATIONS

- A. Seal the space around pipes in sleeves and around duct openings through walls, floors and ceilings. Provide adequate clearance to allow for proper sealing.

#### 3.8 SOUND CONTROL

- A. Penetrations shall be maintained airtight to prevent sound transfer.
- B. Piping, ductwork, etc. shall pass through sleeves. Pack sleeves tight with glass fiber or oakum and caulked on both sides with non-hardening acoustical sealant.

#### 3.9 FIRESTOPPING

- A. Refer to Division 07 - Thermal and Moisture Protection for more information.
- B. Provide UL classified firestopping system for mechanical penetrations through rated walls and floors to maintain the fire rating.

#### 3.10 DELIVERY, STORAGE AND HANDLING OF EQUIPMENT AND MATERIALS

- A. Refer to Division 01 - General Requirements; All equipment and materials shall be delivered, stored and secured per manufacturer's recommendations.
- B. On-site storage shall be coordinated with Construction Manager and be performed in a manner as to avoid damage, deterioration and loss.
- C. Contractor shall provide temporary protection for installed equipment prior to project completion.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. All equipment shall be inspected prior to installation to assure that equipment is free from defect and damage.
- F. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- G. Protect dampers, grilles, louvers from damage to operating linkages and blades.

### 3.11 CLEANING

- A. Refer to Division 01 - General Requirements; all mechanical equipment and components shall be cleaned as frequently as necessary through the construction process and again prior to project completion.

### 3.12 CONTROL WIRING

- A. All control wiring for mechanical and electrical equipment, including motor starters, shall be 120 volt maximum and wired with one side of the coil grounded and the operating contacts in the north side of the circuit. All control wiring shall be installed in conduit.

END OF SECTION

## SECTION 23 0505 - SELECTIVE DEMOLITION FOR HVAC

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Demolition and extension of existing mechanical work.

#### 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, repairs.

#### 1.3 SUMMARY

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the system of minor electrical demolition as described in this specification.
- B. The demolition documents plans and specification have been prepared from existing non-as built documents and cursory non-invasive field investigation.
- C. It is the contractors obligation to become familiar with the extent of demolition and the existing condition before submitting their bid.
- D. During demolition if the contractor discovers unforeseen significant non-code compliance conditions of the existing installation they shall notify the Architect and Engineer immediately in writing.
- E. The contractor shall become familiar with the drawings and scope of work of other trades as the work scope of those trades relates to mechanical equipment and connection requirements.
- F. During demolition the contractor shall record on site as-builts all hydronic system piping capped branches, capped supply air, return air and exhaust ducts for reuse in renovated project space.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- A. Materials and equipment for patching and extending work: As specified in individual sections.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that piping and ductwork to be demolished serve only equipment and facilities within the demolition areas.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Owner before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

- A. Identify locations for capping piping and ductwork before any demolition work commences.
- B. Confirm isolation valve locations for hydronic piping. Repair leaking isolation valves or replace inoperable valves before commencing piping demolition.
- C. Cap and seal air-tight supply, return and exhaust air ductwork at shaft walls before commencing sheet metal demolition

3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

- A. Remove, relocate, and extend existing mechanical piping or sheet metal work to accommodate new construction.
- B. Remove hydronic water piping back to isolation valve.
- C. Remove all supply, return and exhaust air ductwork back to main connection.

3.4 CLEANING AND REPAIR

- A. Refer to Division 01 - General Requirements for procedures.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION



SECTION 23 0523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Ball valves.
- D. Check valves.
- E. Combination flow measuring and balancing valves.

1.2 RELATED REQUIREMENTS

- A. Section 23 0553 - Identification for HVAC Piping and Equipment.
- B. Section 23 0719 - HVAC Piping Insulation.
- C. Section 23 2113 - Hydronic Piping.

1.3 ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. PTFE: Polytetrafluoroethylene.
- E. SWP: Steam working pressure.
- F. TFE: Tetrafluoroethylene.

1.4 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch) 2013 (Reaffirmed 2018).
- B. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves 2017.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- D. ASME B16.34 - Valves — Flanged, Threaded, and Welding End 2020.
- E. ASME B31.9 - Building Services Piping 2020.
- F. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures 1999 (Reapproved 2018).
- G. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.

- H. MSS SP-45 - Bypass and Drain Connections 2003 (Reaffirmed 2008).
- I. MSS SP-67 - Butterfly Valves 2017.
- J. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends 2018.
- K. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves 2013.
- L. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010.

#### 1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.

### PART 2 PRODUCTS

#### 2.1 APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:
  - 1. Throttling (Hydronic): Combinations and Flow Measuring.
  - 2. Isolation (Shutoff): Ball.
- B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- C. Required Valve End Connections for Non-Wafer Types: Use flanges, unions or grooved couplings to allow disconnection of components for servicing.
- D. Hydronic Valves:
  - 1. 2 NPS and Smaller, Bronze Valves.
  - 2. 2-1/2 NPS and Larger, Cast Steel Valves or Butterfly Valves.

#### 2.2 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:

1. Handwheel: Valves other than quarter-turn types.
  2. Hand Lever: Quarter-turn valves 6 NPS and smaller.
- D. Valves in Insulated Piping: Provide 2 NPS stem extensions and the following features:
1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- E. Memory Stops: Fully adjustable after insulation is installed.
- F. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
  2. Solder Joint Connections: ASME B16.18.
- G. General ASME Compliance:
1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
  2. Building Services Piping Valves: ASME B31.9.
- H. Bronze Valves:
1. Fabricate from dezincification resistant material.
  2. Copper alloys containing more than 15 percent zinc are not permitted.
- I. Valve Bypass and Drain Connections: MSS SP-45.

### 2.3 BRONZE BALL VALVES

- A. Two Piece, Full Port with brass Trim:
1. Comply with MSS SP-110.
  2. SWP Rating: 150 psig.
  3. CWP Rating: 600 psig.
  4. Body: Bronze.
  5. Ends: Solder or threaded with union.
  6. Seats: PTFE .
  7. Stem: Bronze or brass.
  8. Ball: Chrome plated brass.
  9. Manufacturers:
    - a. Apollo Valves: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).

- b. Binomi North America.
- c. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com)
- d. Grinnel Products: [www.grinnel.com](http://www.grinnel.com)
- e. Victaulic Company: [www.victaulic.com](http://www.victaulic.com)
- f. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com)
- g. Kitz Corporation of America.
- h. Jomar Valves: [www.jomarvalve.com](http://www.jomarvalve.com)
- i. Substitutions: See Section 01 6000 - Product Requirements.

#### 2.4 BRONZE SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa).
  - 1. Comply with MSS SP-80, Type 3.
  - 2. Body Design: Horizontal flow.
  - 3. Body Material: Bronze, ASTM B62.
  - 4. Ends: Soldered.
  - 5. Disc: Bronze.
  - 6. Manufacturers:
    - a. Apollo Valves: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
    - b. Grinnell Products: [www.grinnell.com](http://www.grinnell.com).
    - c. Kitz Corporation of America.
    - d. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com)
    - e. Victaulic Company: [www.victaulic.com](http://www.victaulic.com)
    - f. Substitutions: See Section 01 6000 - Product Requirements.

#### 2.5 COMBINATION FLOW MEASURING AND BALANCING VALVE

- A. Construction:
  - 1. Manual Flow Control devices shall be fixed orifice venturi, modified venturi, or pitot balancing type accurate to at least +/- 3%.
  - 2. Valves 2-1/2" and smaller shall be modified venturi style, forced brass body and with integrated ball valve, (2) pressure/temperature test ports, additional port for air vent or drain valve, a tag indicating the model and Cv, memory stop with graduated scale, blowout proof stem with dual O-ring seals, interchangeable union end with O-ring seal,

hard chrome plated ball with Teflon seats, and rated at 600 PSI WOG, 325 degrees F.

3. Valves 2-1/2" and larger shall be venturi or pitot balancing type accurate to at least +/- 3%.
  - a. Venturi balancing type shall be a flanged carbon steel ST37 body (per ASME B16.5, Class 150 Flanges); butterfly valve with infinite position memory stop and 316 stainless steel disc. Valve shall have (2) 1/4" NPT ports and be rated for 230 PSI, 250 degrees F.
  - b. Pitot tube balancing type shall be flanged cast iron body (per ASTM A126, Class B Flanges) metering station with stainless steel pitot tube; a tag indicating the model and Cv; butterfly valve with infinite position memory stop and 316 stainless steel disc. Valve shall have a minimum, (2) 1/4" NPT ports, (1) 1/2" NPT port and (1) additional 3/4" NPT port. Valve shall be rated at 175 PSI, 275 degrees F.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

#### 3.2 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Install valves with stems upright or horizontal, not inverted.
- D. Install check valves where necessary to maintain direction of flow as follows:
  1. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

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SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

1.2 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
  - 1. Seton Identification Products, a Tricor Direct Company: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 2. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 3. Champion America, Inc: [www.champion-america.com](http://www.champion-america.com).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Letter Color: White.
- C. Letter Height: 1/4 inch.
- D. Background Color: Black.

2.2 TAGS

- A. Manufacturers:
  - 1. Seton Identification Products, a Tricor Company: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 2. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 3. Champion America, Inc: [www.champion-america.com](http://www.champion-america.com).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

### 2.3 PIPE MARKERS

- A. Manufacturers:
  - 1. Seton Identification Products, a Tricor Company: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 2. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 3. Champion America, Inc: [www.champion-america.com](http://www.champion-america.com).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

### 3.2 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Identify air fan coil units, pumps, heat transfer equipment with nameplates. Small devices, such as inline pumps, may be identified with tags.
- E. Identify control panels and major control components outside panels with nameplates.
- F. Identify thermostats relating to terminal boxes or valves with nameplates.
- G. Identify valves in main and branch piping with tags.
- H. Identify air terminal units and radiator valves with numbered tags.



- I. Identify piping, concealed or exposed, with pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

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SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.
- C. Measurement of final operating condition of HVAC systems.

1.2 RELATED REQUIREMENTS

- A. Section 23 0005 - Basic HVAC Requirements.

1.3 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008, with Errata (2019).
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems 2015, with Errata (2017).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner and Engineer and for inclusion in operating and maintenance manuals.
  - 2. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 3. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 4. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
  - 5. Include the following on the title page of each report:
    - a. Name of Testing, Adjusting, and Balancing Agency.
    - b. Address of Testing, Adjusting, and Balancing Agency.

- c. Telephone number of Testing, Adjusting, and Balancing Agency.
  - d. Project name.
  - e. Project location.
  - f. Report date.
- D. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
- 1. AABC (NSTSB), AABC National Standards for Total System Balance.
  - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  - 3. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
- 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  - 2. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://www.nebb.org/#sle).
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.
- F. Approved TAB Agencies:
- 1. Baromatic.

2. Enviroaire.
3. Controls Solutions Inc. (CSI).
4. Environmental Testing Services.
5. Substitutions must be approved by Engineer during Bid Phase.

### 3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Fire and volume dampers are in place and open.
  8. Air coil fins are cleaned and combed.
  9. Access doors are closed and duct end caps are in place.
  10. Air outlets are installed and connected.
  11. Duct system leakage is minimized.
  12. Hydronic systems are flushed, filled, and vented.
  13. Pumps are rotating correctly.
  14. Proper strainer baskets are clean and in place.
  15. Service and balance valves are open.
- B. Beginning of work means acceptance of existing conditions.

### 3.3 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

### 3.4 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

### 3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- N. On fan powered VAV boxes, adjust air flow switches for proper operation.
- O. For fans with variable pitch sheaves: Sheaves in equipment provided by manufacturer are for final belt and sheave sizing ONLY. TAB contractor shall be responsible for providing and installing final sheave and belt for fan.

### 3.6 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

### 3.7 SCOPE

- A. Test, adjust, and balance the following:
  - 1. Fan coil units.
  - 2. Air Coils.
  - 3. Terminal Heat Transfer Units.
  - 4. Fans.
  - 5. Air Terminal Units.
  - 6. Air Inlets and Outlets.

### 3.8 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:

1. Manufacturer.
  2. Model/Frame.
  3. HP/BHP.
  4. Phase, voltage, amperage; nameplate, actual, no load.
  5. RPM.
  6. Service factor.
  7. Starter size, rating, heater elements.
  8. Sheave Make/Size/Bore.
- B. Cooling Coils:
1. Identification/number.
  2. Location.
  3. Service.
  4. Manufacturer.
  5. Air flow, design and actual.
  6. Entering air DB temperature, design and actual.
  7. Entering air WB temperature, design and actual.
  8. Leaving air DB temperature, design and actual.
  9. Leaving air WB temperature, design and actual.
  10. Water flow, design and actual.
  11. Water pressure drop, design and actual.
  12. Entering water temperature, design and actual.
  13. Leaving water temperature, design and actual.
  14. Saturated suction temperature, design and actual.
  15. Air pressure drop, design and actual.
- C. Heating Coils:
1. Identification/number.
  2. Location.
  3. Service.



4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.
9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

D. Air Moving Equipment:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

E. Return Air/Outside Air:

1. Identification/location.
2. Design air flow.
3. Actual air flow.

4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

F. Duct Traverses:

1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.

G. Terminal Unit Data:

1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.
7. Minimum static pressure.

8. Minimum design air flow.
9. Maximum design air flow.
10. Maximum actual air flow.
11. Inlet static pressure.

H. Air Distribution Tests:

1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION

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## SECTION 23 0713 - DUCT INSULATION

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 0005 - Basic HVAC Requirements.
- B. Section 23 3100 - HVAC Ducts and Casings: Glass fiber ducts.

#### 1.3 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- C. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation 2020.
- D. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2019.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015 (Reapproved 2021)e1.
- H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

#### 1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

## PART 2 PRODUCTS

### 2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### 2.2 GLASS FIBER, FLEXIBLE

#### A. Manufacturer:

1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
2. Johns Manville: [www.jm.com/#sle](http://www.jm.com/#sle).
3. Knauf Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
4. Owens Corning Corporation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
5. Substitutions: See Section 01 6000 - Product Requirements.

#### B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Water Vapor Absorption: 5.0 percent by weight.

#### C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Secure with pressure sensitive tape.

#### D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

#### E. Tie Wire: Annealed steel, 16 gage, 0.0508 inch diameter.

### 2.3 DUCT LINER

#### A. Manufacturers:

1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
2. Johns Manville: [www.jm.com/#sle](http://www.jm.com/#sle).
3. Knauf Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
4. Owens Corning Corporation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
5. Substitutions: See Section 01 6000 - Product Requirements.

- B. Note: Choose the liner type - Elastomeric Foam or Glass Fiber.
- C. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; rigid board and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer.
  - 1. Fungal Resistance: No growth when tested according to ASTM G21.
  - 2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
  - 3. Service Temperature: Up to 250 degrees F.
  - 4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
  - 5. Minimum Noise Reduction Coefficients:
    - a. 1 inch Thickness: 0.45.
- D. Adhesive: Waterproof, fire-retardant type, ASTM C916.
- E. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

#### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
  - 1. Provide insulation with vapor barrier jackets.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. External Duct Insulation Application:
  - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  - 2. Secure insulation without vapor barrier with staples, tape, or wires.

3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

E. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air-flow. Increase duct size to allow for insulation thickness.

### 3.3 SCHEDULES

A. Outside Air Intake Ducts:

1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

B. Plenums:

1. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

C. Return Air Ducts:

1. Duct Liner: 1 inch thick. First 10 feet from equipment only.

D. Supply Ducts:

1. Duct Liner: 1 inch thick. First 10 feet from equipment only.
2. Located in plenum or unconditioned space:
  - a. Flexible Glass Fiber Duct Insulation: 1-1/2 inches thick.

E. Transfer Ducts:

1. Duct Liner: 1 inch thick. First 10 feet from equipment only.

END OF SECTION



## SECTION 23 0719 - HVAC PIPING INSULATION

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

#### 1.2 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

#### 1.3 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.
- D. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation 2017.
- E. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2020a.
- F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

## PART 2 PRODUCTS

### 2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### 2.2 GLASS FIBER, RIGID

#### A. Manufacturers:

1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
2. Johns Manville Corporation: [www.jm.com/#sle](http://www.jm.com/#sle).
3. Knauf Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
4. Owens Corning Corporation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
5. Substitutions: See Section 01 6000 - Product Requirements.

#### B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

1. K Value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum Service Temperature: 850 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.

#### C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

#### D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

#### E. Vapor Barrier Lap Adhesive: Compatible with insulation.

#### F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

#### G. Indoor Vapor Barrier Finish:

1. Vinyl emulsion type acrylic, compatible with insulation, black color.

### 2.3 HYDROUS CALCIUM SILICATE

#### A. Insulation: ASTM C533 and ASTM C795; rigid molded, asbestos free, gold color.

1. K Value: 0.40 at 300 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
2. Maximum Service Temperature: 1200 degrees F.

3. Density: 15 lb/cu ft.

B. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

## 2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Aeroflex USA, Inc: [www.aeroflexusa.com/#sle](http://www.aeroflexusa.com/#sle).

2. Armacell LLC: [www.armacell.us/#sle](http://www.armacell.us/#sle).

3. K-Flex USA LLC: [www.kflexusa.com/#sle](http://www.kflexusa.com/#sle).

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature: 180 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

## 2.5 JACKETS

A. PVC Plastic.

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

d. Thickness: 10 mil.

e. Connections: Brush on welding adhesive.

2. Covering Adhesive Mastic: Compatible with insulation.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

### 3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated Pipes Conveying Fluids Below Ambient Temperature:
  - 1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
- F. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
  - 3. Do not bury hangers in the insulation. Insulation vapor barrier shall not be broken.
- G. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- H. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- I. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
  - 1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- J. Inserts and Shields:
  - 1. Application: Piping 1-1/2 inches diameter or larger.
  - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - 3. Insert location: Between support shield and piping and under the finish jacket.
  - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  - 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- K. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.

### 3.3 SCHEDULE

#### A. Heating Systems:

1. Heating Water Supply and Return:
  - a. Pipe Size Range: 3/4 to 1-1/2" inch: 1-1/2 inches thick.
  - b. Pipe Size Range: 2 to 6 inch: 2 inches thick.

#### B. Cooling Systems:

1. Chilled Water: 1-1/2 inches thick.
2. Cold Condensate Drains: 1 inch thick.
3. Condensate Drains from Cooling Coils: 1 inch thick.
4. Refrigerant Suction: 3/4 inch thick Flexible Elastomeric
5. Refrigerant Hot Gas: 3/4 inch thick Flexible Elastomeric

END OF SECTION

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SECTION 23 0913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Control panels.
- B. Control Valves:
  - 1. Ball valves and actuators.
  - 2. Electronic operators.
- C. Dampers.
- D. Damper Operators:
  - 1. Electric operators.
- E. Input/Output Sensors:
  - 1. Temperature sensors.
  - 2. Equipment operation (current) sensors.
- F. Thermostats:
  - 1. Low-limit temperature cutout switch (freezestat)
  - 2. Room thermostat accessories.
  - 3. Airstream thermostats.

1.2 RELATED REQUIREMENTS

- A. Section 23 0519 - Meters and Gauges for HVAC Piping: Thermometer sockets and gauge taps.
- B. Section 23 0923 - Direct-Digital Control System for HVAC.
- C. Section 23 2113 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.
- D. Section 23 2114 - Hydronic Specialties.
- E. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.
- F. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.3 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating 2018.
- B. ANSI/FCI 70-2 - Control Valve Seat Leakage 2013.

- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
- D. Manufacturer's Instructions: Provide for all manufactured components.
- E. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
- F. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
  - 1. Revise shop drawings to reflect actual installation and operating sequences.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

#### 1.6 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Substantial Completion.

### PART 2 PRODUCTS

#### 2.1 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

#### 2.2 CONTROL PANELS

- A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.
- B. NEMA 250, general purpose utility enclosures with enameled finished face panel.
- C. Provide common keying for all panels.

#### 2.3 CONTROL VALVES



A. Performance Requirements:

1. 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. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.
3. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements" to size products where indicated as delegated design.
4. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.
5. Backup Power Source: Systems and equipment served by a backup power source shall have associated control valve actuators served from a backup power source.
6. Environmental Conditions:
  - a. Provide electric control valve actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control valve actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.
7. Determine control valve sizes and flow coefficients by ISA 75.01.01.
8. Control valve characteristics and rangeability shall comply with ISA 75.11.01.
9. Selection Criteria:
  - a. Control valves shall be suitable for operation at following conditions:
    - 1) Chilled Water: 150 PSI.
    - 2) Condenser Water: 150 PSI.
    - 3) Heating Hot Water: 150 PSI.
  - b. Control valve shutoff classifications shall be FCI 70-2, Class IV or better unless otherwise indicated.
  - c. Valve pattern, three-way or straight through, shall be as indicated on Drawings.
  - d. Modulating straight-through pattern control valves shall have equal percentage flow-throttling characteristics unless otherwise indicated.
  - e. Modulating three-way pattern water valves shall have linear flow-throttling characteristics. The total flow through the valve shall remain constant regardless of the valve's position.
  - f. Modulating butterfly valves shall have linear or equal percentage flow-throttling characteristics.
  - g. Fail positions unless otherwise indicated:

- 1) Chilled Water: Open.
  - 2) Condenser Water: Open.
  - 3) Heating Hot Water: Open.
- h. Globe-type control valves shall pass the design flow required with not more than 95 percent of stem lift unless otherwise indicated.
  - i. Rotary-type control valves, such as ball and butterfly valves, shall have Cv falling between 65 and 75 degrees of valve full open position and minimum valve Cv between 15 and 25 percent of open position.
  - j. Selection shall consider viscosity, flashing, and cavitation corrections.
  - k. Minimum Cv shall be calculated at 10 percent of design flow, with a coincident pressure differential equal to the system design pump head.
  - l. In water systems, select modulating control valves at terminal equipment for a design Cv based on a pressure drop of 5 psig at design flow unless otherwise indicated.
  - m. In water systems, use ball- or globe-style control valves for two-position control for valves NPS 2 and smaller and butterfly style for valves larger than NPS 2.
- B. Ball Valves and Actuators:
1. Manufacturers:
    - a. Belimo Aircontrols (USA), Inc: [www.belimo.com/#sle](http://www.belimo.com/#sle).
    - b. Flow Tech.
    - c. Substitutions: See Section 01 6000 - Product Requirements.
  2. Service: Use for brine (30 percent glycol), chilled water, or hot water.
  3. Flow Characteristic: Equal percentage. Include 2-way and 3-way mixing operation configured to fail normally open (NO). Refer to Drawings.
  4. Replacements in Kind: Provide pressure-independent type.
  5. Rangeability: 500 to 1.
  6. ANSI Rating: Class 300.
  7. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
  8. Body Size:
    - a. Under 2-1/2 inches:
      - 1) Connection: NPT.
      - 2) Materials:

- (a) Body: Brass.
  - (b) Flanges: Ductile iron.
  - (c) Ball: Chrome-plated brass.
  - (d) Stem: Nickel-plated brass.
  - (e) Stem sleeve or other approved means to allow valve to be opened and closed without damaging field-applied insulation and insulation vapor barrier seal.
  - (f) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
  - (g) Stem Seal: EPDM O-Rings.
  - (h) Flow Control Disk: Thermoplastic synthetic-resin.
- b. Service Temperature:
- 1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
  - 2) Ambient Side: From minus 4 to 122 degrees F.
9. Actuator Requirements:
- a. Assembly: Factory-mounted.
  - b. Input: 0 to 5 VDC configured as indicated on drawings.
  - c. Accessories: Provide with valve position indicator and manual override.
- C. Electronic Operators:
- 1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
  - 2. Select operator for full shut off at maximum pump differential pressure.
  - 3. Position indicator and graduated scale on each actuator.
  - 4. Type: Motor operated, with or without gears, electric and electronic.
  - 5. Voltage: Voltage selection delegated to professional designing control system.
  - 6. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
  - 7. Function properly within a range of 85 to 120 percent of nameplate voltage.
  - 8. Construction:
    - a. For Actuators Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.

- b. For Actuators from 100 to 400 W: Gears ground steel, oil immersed, shaft hardened steel running in bronze, copper alloy or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel or cast-aluminum housing.
  - c. For Actuators Larger Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.
9. Field Adjustment:
- a. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.
  - b. Gear Type Actuators: External manual adjustment mechanism to allow manual positioning when the actuator is not powered.
10. Modulating Actuators:
- a. Operation: Capable of stopping at all points across full range, and starting in either direction from any point in range.
  - b. Control Input Signal:
    - 1) Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs.
    - 2) One input drives actuator to open position and other input drives actuator to close position. No signal of either input remains in last position.
    - 3) Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for zero- to 10 and 4- to 20-mA signals.
    - 4) Pulse Width Modulation (PWM): Actuator drives to a specified position according to pulse duration (length) of signal from a dry contact closure, triac sink, or source controller.
    - 5) Programmable Multi-Function:
    - 6) Control Input, Position Feedback, and Running Time: Factory or field programmable.
    - 7) Diagnostic: Feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
    - 8) Service Data: Include, at a minimum, number of hours powered and number of hours in motion.
11. Position Feedback:
- a. Equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.
  - b. Equip modulating actuators with a position feedback through voltage signal for remote monitoring.

- c. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.
12. Fail-Safe:
- a. Where indicated, provide actuator to fail to an end position.
  - b. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
  - c. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.
13. Integral Overload Protection:
- a. Provide against overload throughout the entire operating range in both directions.
  - b. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.
14. Valve Attachment:
- a. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve shaft without the need for connecting linkages.
  - b. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.
  - c. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.
15. Temperature and Humidity:
- a. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
  - b. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.
16. Enclosure:
- a. Suitable for ambient conditions encountered by application.
  - b. NEMA 250, Type 2 for indoor and protected applications.
  - c. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
  - d. Provide actuator enclosure with heater and control where required by application.
17. Stroke Time:
- a. Operate valve from fully closed to fully open within 60 seconds.
  - b. Operate valve from fully open to fully closed within 60 seconds.

- c. Move valve to failed position within 15 seconds.
- d. Select operating speed to be compatible with equipment and system operation.

18. Sound:

- a. Spring Return: 62 dBA.
- b. Non-Spring Return: 45 dBA.

2.4 DAMPERS

A. Performance Requirements:

1. 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. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.
3. Delegated Design: Engage a qualified professional, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.
4. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.
5. Backup Power Source: Systems and equipment served by a backup power source shall have associated control damper actuators served from a backup power source.
6. Environmental Conditions:
7. Provide electric control-damper actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated.
8. Electric control-damper actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.
9. Hazardous Locations: Explosion-proof rating for condition.
10. Selection Criteria:
  - a. Fail positions unless otherwise indicated:
    - 1) Supply Air: Last position.
    - 2) Return Air: Last position.
    - 3) Outdoor Air: Last position.
    - 4) Mixed Air: Last position.
    - 5) Exhaust Air: Last position.
  - b. Dampers shall have stable operation throughout full range of operation, from design to minimum airflow over varying pressures and temperatures encountered.

- c. Select modulating dampers for a pressure drop of 2 percent of fan total static pressure unless otherwise indicated.
  - d. Two-position dampers shall be full size of duct or equipment connection unless otherwise indicated.
  - e. Pneumatic, two-position control dampers shall provide a smooth opening and closing characteristic slow enough to avoid excessive pressure. Dampers with pneumatic actuators shall have an adjustable opening time (valve full closed to full open) and an adjustable closing time (valve full open to full closed) ranging from zero to 10 seconds. Opening and closing times shall be independently adjustable.
  - f. Control-damper, pneumatic-control signal shall not exceed 200 feet. For longer distances, provide an electric/electronic control signal to the damper and an electric solenoid valve or electro-pneumatic transducer at the damper to convert the control signal to pneumatic.
- 11. Unless otherwise indicated, use parallel blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed blade configuration.
  - 12. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.
  - 13. Damper actuator shall be factory installed by damper manufacturer as integral part of damper assembly. Coordinate actuator location and mounting requirements with damper manufacturer.
- B. Manufacturers:
- 1. Ruskin.
  - 2. Greenheck.
  - 3. Substitutions: See Section 01 6000 - Product Requirements.
- C. Performance: Test in accordance with AMCA 500-D.
- D. Frames: Extruded aluminum, welded or riveted with corner reinforcement, minimum 12 gage, 0.1046 inch.
- E. Blade Seals: Synthetic elastomeric, mechanically attached, field replaceable.
- F. Jamb Seals: Spring stainless steel.
- G. Shaft Bearings: Molded synthetic or stainless-steel sleeve mounted in frame..
- H. Leakage: Less than one percent based on approach velocity of 2000 ft per min and 4 inches wg.
- I. Pressure Drop: 0.05-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.

- J. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.

## 2.5 DAMPER OPERATORS

- A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
  - 1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
  - 2. Provide one operator for maximum 36 sq ft damper section.
- B. Electric Operators:
  - 1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

## 2.6 INPUT/OUTPUT SENSORS

- A. Temperature Sensors:
  - 1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
  - 2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
  - 3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
  - 4. Temperature Sensing Device: Compatible with project DDC controllers.
  - 5. Performance Characteristics:
    - a. RTD:
      - 1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
      - 2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
      - 3) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
    - b. Thermistor:
      - 1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
      - 2) Range: Minus 25 degrees F through 122 degrees F minimum.
    - c. Sensing Range:
      - 1) Provide limited range sensors if required to sense the range expected for a respective point.



- 2) Use RTD type sensors for extended ranges beyond minus 30 degrees F to 230 degrees F.
  - 3) Use temperature transmitters in conjunction with RTD's when RTD's are incompatible with DDC controller direct temperature input.
- d. Wire Resistance:
- 1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F or use temperature transmitter when offset is greater than 1.0 degree F due to wire resistance.
  - 2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.
- e. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.
- f. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.
- g. Ceiling and Recessed Mount Temperature Sensors: Ceiling-mounted sensor in a low-profile housing.
- h. Room Temperature Sensors with Integral Digital Display:
- 1) Construct for surface or wall box.
  - 2) Provide a digital display and keypad with the following capabilities:
    - (a) Indication of space and outdoor temperatures.
    - (b) Setpoint adjustment to accommodate room setpoint.
    - (c) Manual occupancy override and indication of occupancy status.
    - (d) Controller mode status.
- B. Equipment Operation (Current) Sensors:
1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.
  2. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

## 2.7 THERMOSTATS

- A. Low-Limit Temperature Cutout Switch (low-limit thermostat or freezestat):
1. Configuration: Digital module tied to sensor-assembly.
  2. Sensing Length: 4 feet.
  3. Setpoint Adjust: Slider.

4. Switch Type: SPDT, snap-action, form C in dust-protected enclosure.
  5. Mounting: Locate on cooling coil intake side.
  6. Field Interface: Connect load line-voltage to stater.
  7. Electrical Rating: Pilot duty, 125 VA at 125 to 600 VAC.
- B. Room Thermostat Accessories:
1. Thermostat Covers: Vandal proof clear plastic..
  2. Insulating Bases: For thermostats located on exterior walls.
- C. Airstream Thermostats:
1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
  2. Averaging service remote bulb element: 7.5 feet.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.
- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation of components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

#### 3.2 INSTALLATION

- A. Furnish and install products required to satisfy most stringent requirements indicated.
- B. Install products level, plumb, parallel, and perpendicular with building construction.
- C. Install in accordance with manufacturer's instructions.
- D. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches and humidistats. Refer to Section 26 2726.

- E. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.
- F. Provide guards on thermostats in public areas and where indicated.
- G. Provide valves with position indicators and with pilot positioners where sequenced with other controls.
- H. Provide isolation (two position) dampers of parallel blade construction.
- I. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.
- J. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.
- K. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.
- L. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

### 3.3 MAINTENANCE

- A. Provide service and maintenance of control system for one year from Date of Substantial Completion.

END OF SECTION

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SECTION 23 0923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. System description.
- B. Controllers.
- C. Power supplies and line filtering.
- D. System software.
- E. Controller software.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for each system component and software module.
- C. Shop Drawings:
  - 1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
  - 2. List connected data points, including connected control unit and input device.
  - 3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
  - 4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
  - 5. Indicate description and sequence of operation of operating, user, and application software.
- D. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.
- E. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
  - 1. Revise shop drawings to reflect actual installation and operating sequences.
- F. Operation and Maintenance Data:

1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
  2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
  3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

#### 1.5 QUALITY ASSURANCE

- A. Acceptable Control System Contractors: Company specializing in the installation of building control, automation and monitoring systems (a.k.a. DDC systems, Building Management Systems (BMS) or Building Automation Systems (BAS)) and HVAC control systems with a minimum five years documented HVAC experience, trained, certified and approved by the system manufacturer. Approved Control System Contractors include:
1. MCMI - Contact Mark Shippy (586) 738-1623
  2. Others by Prior Approval before receipt of bids - ONLY
- B. Perform work in accordance with NFPA 70.
- C. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

#### 1.6 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a one year period after Substantial Completion.
- C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

### PART 2 PRODUCTS

#### 2.1 SYSTEM DESCRIPTION

- A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.
- B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.
- C. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

- D. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

## 2.2 CONTROLLERS

### A. Manufacturers:

- 1. Andover or compatible with the existing Andover System
- 2. Others by Prior Approval before receipt of bids

### B. CUSTOM APPLICATION CONTROLLERS

#### 1. General:

- a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
- b. Share data between networked, microprocessor based controllers.
- c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
- d. Utilize real-time clock for scheduling.
- e. Continuously check processor status and memory circuits for abnormal operation.
- f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
- g. Communication with other network devices to be based on assigned protocol.

#### 2. Communication:

- a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
- b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

#### 3. Anticipated Environmental Ambient Conditions:

- a. Outdoors and/or in Wet Ambient Conditions:
  - 1) Mount within waterproof enclosures.
  - 2) Rated for operation at 40 to 150 degrees F.
- b. Conditioned Space:
  - 1) Mount within dustproof enclosures.
  - 2) Rated for operation at 32 to 120 degrees F.

- c. Diagnostic LED's for power, communication, and processor.
  - d. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
4. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
5. Power and Noise Immunity:
- a. Maintain operation at 90 to 110 percent of nominal voltage rating.
  - b. Perform orderly shutdown below 80 percent of nominal voltage.
  - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.
- C. Application Specific Controllers:
1. General:
- a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
  - b. Customized for operation within the confines of equipment served.
  - c. Communication with other network devices to be based on assigned protocol.
2. Communication:
- a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
  - b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
- a. Outdoors and/or in Wet Ambient Conditions:
    - 1) Mount within waterproof enclosures.
    - 2) Rated for operation at 40 to 150 degrees F.
  - b. Conditioned Space:
    - 1) Mount within dustproof enclosures.
    - 2) Rated for operation at 32 to 120 degrees F.
4. Provisions for Serviceability:
- a. Diagnostic LEDs for power, communication, and processor.



- b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
  - a. Maintain operation at 90 to 110 percent of nominal voltage rating.
  - b. Perform orderly shutdown below 80 percent of nominal voltage.
  - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.

## 2.3 POWER SUPPLIES AND LINE FILTERING

### A. Power Supplies:

1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
2. Limit connected loads to 80 percent of rated capacity.
3. Match DC power supply to current output and voltage requirements.
4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
7. Operational Ambient Conditions: 32 to 120 degrees F.
8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD 810 for shock and vibration.
9. Line voltage units UL recognized and CSA approved.

### B. Power Line Filtering:

1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
2. Minimum surge protection attributes:
  - a. Dielectric strength of 1000 volts minimum.
  - b. Response time of 10 nanoseconds or less.
  - c. Transverse mode noise attenuation of 65 dB or greater.

- d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

## 2.4 LOCAL AREA NETWORK (LAN)

- A. Provide communication between control units over local area network (LAN).
- B. LAN Capacity: Not less than 60 stations or nodes.
- C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.
- D. LAN Data Speed: Minimum 19.2 Kb.
- E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.
- F. Transmission Median: Fiber optic or single pair of solid 24 gage twisted, shielded copper cable.
- G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

## 2.5 SYSTEM SOFTWARE

- A. The BMS system software (head end software) is existing. The new controllers and equipment shall be connected and configured into the existing BMS system.
- B. Operating System:
  - 1. Concurrent, multi-tasking capability.
  - 2. Custom Graphics Generation Package: Create custom graphics for the new equipment being connected into the existing BMS system.
    - a. Create, modify, and save graphic files and visio format graphics in PCX formats.
    - b. HTML graphics to support web browser compatible formats.
    - c. Capture or convert graphics from AutoCAD.
- C. Workstation System Applications:
  - 1. The BMS system is existing. Configure the new equipment into the existing BMS system. Provide for scheduling equipment on/off, occupied/unoccupied, set point adjustment, monitoring, alarming, etc.
  - 2. The new equipment shall be connected via BACnet MSTP or LON to an existing or new BMS controller. Provide for integration of data points from equipment controllers into BMS for remote monitoring and control.

## 2.6 CONTROLLER SOFTWARE

- A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

- B. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.
- C. Alarms:
  - 1. Binary object is set to alarm based on the operator specified state.
  - 2. Analog object to have high/low alarm limits.
  - 3. All alarming is capable of being automatically and manually disabled.
  - 4. Alarm Reporting:
    - a. Operator determines action to be taken for alarm event.
    - b. Alarms to be routed to appropriate workstation.
    - c. Reporting Options:
- D. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.
- E. Anti-Short Cycling:
  - 1. All binary output objects protected from short-cycling.
  - 2. Allows minimum on-time and off-time to be selected.
- F. On-Off Control with Differential:
  - 1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
  - 2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify existing conditions before starting work.

#### 3.2 INSTALLATION

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
- B. Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.
- C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.
- D. Install control components provided with packaged equipment, including but not limited to temperature sensors, CO2 sensors, pressure sensors.

### 3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. The control contractor shall be responsible to provide additional 120V power as required for temperature controls and building automation. Some circuits may be indicated on the electrical drawings (if applicable) or provided from existing controllers being removed. If additional circuits are required, coordinate with the electrical contractor and/or owner's representative for locations of available circuits and provide circuit breakers, wiring and conduit as necessary.
- B. The control contractor shall be responsible to provide low-voltage power supplies, wiring, conduit, etc. as necessary to power control, metering and monitoring devices.
- C. Install signal and communication cable according to DDC system or packaged equipment manufacturer's recommendations.
  - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
  - 2. Install exposed cable in raceway. Wiring and cable in mechanical rooms shall be installed in conduit.
  - 3. Install concealed cable in raceway.
  - 4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
  - 5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
  - 6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
  - 7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
  - 8. Low voltage cabling shall be run separate from 120V control wiring.
  - 9. Input and output wiring shall be run in separate conduit systems.
  - 10. Analog inputs shall be run separate from digital inputs.
  - 11. Network cabling shall be run in separate conduit systems.
  - 12. No control wiring splices are allowed.

### 3.4 MANUFACTURER'S FIELD SERVICES

- A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

### 3.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate complete and operating system to Owner.

### 3.6 MAINTENANCE

- A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.
- B. Provide two complete inspections, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.
- C. Provide complete service of systems, including call backs. Make minimum of 2 complete normal inspections of approximately 2 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

END OF SECTION

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## SECTION 23 2113 - HYDRONIC PIPING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Chilled water piping, above grade.
- D. Condenser water piping, above grade.
- E. Equipment drains and overflows.
- F. Pipe hangers and supports.
- G. Unions, flanges, mechanical couplings, and dielectric connections.

#### 1.2 RELATED REQUIREMENTS

- A. Section 08 3100 - Access Doors and Panels.
- B. Section 23 0523 - General-Duty Valves for HVAC Piping.
- C. Section 23 0553 - Identification for HVAC Piping and Equipment.
- D. Section 23 0719 - HVAC Piping Insulation.
- E. Section 23 2114 - Hydronic Specialties.
- F. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

#### 1.3 REFERENCE STANDARDS

- A. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2021.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- E. ASME B31.9 - Building Services Piping 2020.
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.
- H. ASTM B32 - Standard Specification for Solder Metal 2020.
- I. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.

- J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- K. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers 1992, with Editorial Revision (2018).
- L. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications 2007 (Reapproved 2019).
- M. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2011 (Amended 2012).
- N. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020.
- O. AWWA C606 - Grooved and Shouldered Joints 2015.
- P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
  - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
  - 2. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.
- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Project Record Documents: Record actual locations of valves.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.
- B. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.
- C. Coupling Manufacturer:
  - 1. Perform on-site training by factory-trained representative to the Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.
  - 2. Periodic job site visits by factory-trained representative to ensure best practices in grooved joint installation.
- D. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

#### 1.6 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.



## PART 2 PRODUCTS

### 2.1 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
  - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
  - 2. Use non-conducting dielectric connections whenever joining dissimilar metals.
  - 3. Grooved mechanical joints may be used in accessible locations only.
    - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
    - b. Use rigid joints unless otherwise indicated.
  - 4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated:
  - 1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.

### 2.2 HEATING WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
  - 1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
  - 2. Threaded Joints: ASME B16.3, malleable iron fittings.
  - 3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn, using one of the following joint types:
  - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
    - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
    - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

### 2.3 CHILLED WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
  1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
  2. Threaded Joints: ASME B16.3, malleable iron fittings.
  3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), hard drawn; using one of the following joint types:
  1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
    - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
  2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
  3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

### 2.4 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn; using one of the following joint types:
  1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

### 2.5 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
  1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

### 2.6 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2 Inches and Less:
  1. Ferrous Piping: 150 psig malleable iron, threaded.
  2. Copper Pipe: Bronze, soldered joints.
- B. Flanges for Pipe 2 Inches and Greater:

1. Ferrous Piping: 150 psig forged steel, slip-on.
  2. Copper Piping: Bronze.
  3. Gaskets: 1/16 inch thick, preformed neoprene.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
1. Dimensions and Testing: In accordance with AWWA C606.
  2. Mechanical Couplings: Comply with ASTM F1476.
  3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
  4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
  5. Manufacturers:
    - a. Anvil International: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
    - b. Grinnell Products: [www.grinnell.com/#sle](http://www.grinnell.com/#sle).
    - c. Victaulic Company: [www.victaulic.com/#sle](http://www.victaulic.com/#sle).
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- D. Dielectric Connections:
1. Waterways:
    - a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
    - b. Dry insulation barrier able to withstand 600-volt breakdown test.
    - c. Construct of galvanized steel with threaded end connections to match connecting piping.
    - d. Suitable for the required operating pressures and temperatures.
  2. Flanges:
    - a. Dielectric flanges with same pressure ratings as standard flanges.
    - b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
    - c. Dry insulation barrier able to withstand 600-volt breakdown test.
    - d. Construct of galvanized steel with threaded end connections to match connecting piping.
    - e. Suitable for the required operating pressures and temperatures.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Prepare piping connections to equipment using jointing system specified.
- E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- F. After completion, fill, clean, and treat systems. Refer to Section 23 2500 for additional requirements.

### 3.2 PIPING APPLICATIONS

- A. Heating water piping, above ground:
  - 1. Pipe sizes 3/4" - 2": Copper, soldered/brazed joints.
  - 2. Pipe sizes 2 1/2" and larger: Schedule 40 black steel, welded joints or grooved joints where allowed
- B. Chilled water piping, above ground:
  - 1. Pipe sizes 3/4" - 2": Copper, soldered/brazed joints; schedule 40 black steel threaded joints.
  - 2. Pipe sizes 2 1/2" and larger: Schedule 40 black steel, welded or grooved joints.

### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and to avoid interference with use of space.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipe passing through partitions, walls, and floors.
- F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.
- G. Slope piping and arrange to drain at low points.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Grooved Joints:

1. Install in accordance with the manufacturer's latest published installation instructions.
2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

J. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
2. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
3. Place hangers within 12 inches of each horizontal elbow.
4. Use hangers with 1-1/2 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
7. Provide copper plated hangers and supports for copper piping.

K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

L. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 3100.

M. Use eccentric reducers to maintain top of pipe level.

N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.

O. Install valves with stems upright or horizontal, not inverted.

### 3.4 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during 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 shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
  2. While filling system, use vents installed at high points of system to release 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 shall not 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, "Building Services Piping."
  5. After hydrostatic test pressure has been applied for at least 4 hours, 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.
- C. Perform the following before operating the system:
1. Open manual valves fully.
  2. Inspect pumps for proper rotation. Set makeup pressure-reducing valves for required system pressure.
  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.
  5. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
  6. Verify lubrication of motors and bearings.

END OF SECTION

## SECTION 23 2114 - HYDRONIC SPECIALTIES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Air vents.
- B. Strainers.
- C. Pressure-temperature test plugs.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping.

#### 1.3 REFERENCE STANDARDS

- A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels 2021.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

### PART 2 PRODUCTS

#### 2.1 AIR VENTS

- A. Manufacturers:
  - 1. Armstrong International, Inc: [www.armstronginternational.com/#sle](http://www.armstronginternational.com/#sle).
  - 2. ITT Bell & Gossett: [www.bellgossett.com/#sle](http://www.bellgossett.com/#sle).
  - 3. Taco, Inc: [www.taco-hvac.com/#sle](http://www.taco-hvac.com/#sle).
  - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Manual Type: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- C. Float Type:
  - 1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
- D. Washer Type:

1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring-loaded ball check valve.

## 2.2 STRAINERS

### A. Manufacturers:

1. Armstrong International, Inc: [www.armstronginternational.com/#sle](http://www.armstronginternational.com/#sle).
2. Grinnell Products: [www.grinnell.com/#sle](http://www.grinnell.com/#sle).
3. The Metraflex Company: [www.metroflex.com/#sle](http://www.metroflex.com/#sle).
4. Titan Flow Control..
5. Substitutions: See Section 01 6000 - Product Requirements.

### B. Size 2 inch and Under:

1. Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

## 2.3 PRESSURE-TEMPERATURE TEST PLUGS

### A. Manufacturers:

1. Ferguson Enterprises Inc: [www.fnw.com/#sle](http://www.fnw.com/#sle).
2. Peterson Equipment Company Inc: [www.petesplug.com/#sle](http://www.petesplug.com/#sle).
3. Sisco Manufacturing Company Inc: [www.siscomfg.com/#sle](http://www.siscomfg.com/#sle).

### B. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

### C. Application: Use extended length plugs to clear insulated piping.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- C. Provide manual air vents at system high points and as indicated.
- D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

END OF SECTION



## SECTION 23 2500 - HVAC WATER TREATMENT

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Materials.
  - 1. System cleaner.
  - 2. Closed system treatment (water).
- B. Glycol solution.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 6000 - Product Requirements: Owner furnished treatment equipment.
- B. Section 23 2113 - Hydronic Piping.
- C. Section 23 2114 - Hydronic Specialties.

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.
- D. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.
- E. Manufacturer's Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.
- F. Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.
- G. Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Sufficient chemicals for treatment and testing during required maintenance period.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience. Company shall

have local representatives with water analysis laboratories and full time service personnel.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. AmSolv-Amrep, Inc: [www.amsolv.com/#sle](http://www.amsolv.com/#sle).
- B. GE Water & Process Technologies: [www.gewater.com/#sle](http://www.gewater.com/#sle).
- C. Nalco, an Ecolab Company: [www.nalco.com/#sle](http://www.nalco.com/#sle).
- D. H-O-H Water Technologies, Inc.
- E. Substitutions: See Section 01 6000 - Product Requirements.

### 2.2 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

### 2.3 MATERIALS

- A. System Cleaner:
  - 1. Manufacturers:
    - a. As recommended by chemical treatment manufacturer..
  - 2. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.
- B. Closed System Treatment (Water):
  - 1. Sequestering agent to reduce deposits and adjust pH.
  - 2. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazone, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.
  - 3. Conductivity enhancers; phosphates or phosphonates.

### 2.4 GLYCOL SOLUTION

- A. The chilled water system is provided with glycol. Field verify the type and concentration of glycol used in the system.
- B. Furnish Dow Chemical, Interstate Chemical or approved equal factory inhibited propylene or ethylene glycol to fill the system with a blend of glycol and deionized water. Match existing concentration. The solution shall contain a fluorescent dye to facilitate leak detection.
- C. The solution shall be pre-mixed at the manufacturers factory with the appropriate inhibitors, buffers, and deionized water which meets the following industry standards for water quality: Less than 25 PPM sulfate; less than 25 PPM chloride; less than 50 PPM sodium; less than 1 PPM magnesium and less than 1 PPM calcium.

- D. Under no circumstances should tap water or raw water be added to the system initially for make-up requirements.

### PART 3 EXECUTION

#### 3.1 PREPARATION

- A. Drain and carefully store any glycol solution required to be removed from the system to make system modifications. Field verify exact requirements and extent of drain down required to complete the work.
- B. Place terminal control valves in open position during cleaning.
- C. Verify that electric power is available and of the correct characteristics.

#### 3.2 CLEANING SEQUENCE

- A. Concentration:
  - 1. As recommended by manufacturer.
- B. Hot Water Heating Systems:
  - 1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.
  - 2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
  - 3. Circulate for 6 hours at design temperatures, then drain.
  - 4. Refill with clean water and repeat until system cleaner is removed.
- C. Chilled Water Systems:
  - 1. Circulate for 48 hours, then drain systems as quickly as possible.
  - 2. Refill with clean water, circulate for 24 hours, then drain.
  - 3. Refill with clean water and repeat until system cleaner is removed.
- D. Flush open systems and glycol filled closed systems with clean water for one hour minimum. Drain completely and refill.
- E. Remove, clean, and replace strainer screens.
- F. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

#### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

#### 3.4 CLOSED SYSTEM TREATMENT

- A. Introduce closed system treatment through bypass feeder when required or indicated by test. Test and check system water at the completion of construction. Add chemical as needed.
- B. Systems with glycol: Glycol drained and stored may be reintroduced into the system after system is cleaned. Provide additional glycol as necessary to completely fill the system after completion of construction. Match type and concentration of existing system. Verify with owner. New glycol and any additives shall be compatible with existing.

3.5 CLOSEOUT ACTIVITIES

3.6 MAINTENANCE

- A. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.
- B. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.
- C. Provide two (2) follow up technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.
- D. Provide laboratory and technical assistance services during this maintenance period.

END OF SECTION

## SECTION 23 3100 - HVAC DUCTS AND CASINGS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Single-wall rectangular ducts and fittings.
- B. Single-wall round ducts and fittings.
- C. Sheet metal materials.
- D. Sealants and gaskets.
- E. Hangers and supports.

#### 1.2 RELATED REQUIREMENTS

- A. Division 07 - Thermal Moisture Protection: Firestopping
- B. Section 23 0005 - Basic HVAC Requirements
- C. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
- D. Section 23 0713 - Duct Insulation: External insulation and duct liner.
- E. Section 23 3300 - Air Duct Accessories.
- F. Section 23 3700 - Air Outlets and Inlets.

#### 1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
- D. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.
- G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations 2021.
- H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- I. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors current edition, including all revisions.

- J. UL 1978 - Grease Ducts Current Edition, Including All Revisions.
- K. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies Current Edition, Including All Revisions.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

#### 1.5 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.
- B. Product Data: Provide data for duct materials, duct liner, duct connections, and factory fabricated fittings.
- C. Shop Drawings: Submit 1/4 scale, double line shop drawings that indicate duct fittings, duct size, bottom of duct elevations, necessary offsets to accommodate building structure, particulars such as gages, sizes, welds, elevations, all fittings, and configuration prior to start of work for all systems.

#### 1.6 REGULATORY REQUIREMENTS

- A. Construct ductwork to SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 1995, Second Edition with Addendum No. 1.

### PART 2 PRODUCTS

#### 2.1 SINGLE-WALL RECTANGULAR DUCT AND FITTING ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," 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."

- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.2 SINGLE-WALL ROUND DUCT AND FITTING ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. McGill AirFlow LLC.
    - b. Spiral Manufacturing Co., Inc.
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.3 MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- C. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G90.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- D. Galvanealed Sheet Steel (FOR EXPOSED, PAINTED DUCTWORK): Comply with ASTM A653-09; hot dipped zinc iron coated steel, annealed, coating designation "A" (A60, A40)
- E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

#### 2.4 SEALANTS AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
  - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
  - 2. Tape Width: 3 inches.
  - 3. Sealant: Modified styrene acrylic.
  - 4. Water resistant.
  - 5. Mold and mildew resistant
  - 6. Maximum Static-Pressure Class: 10-in wg, positive and negative
  - 7. Service: Indoor and outdoor
  - 8. Service Temperature: Minus 40 to plus 200 deg F.
  - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.



10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
  2. Solids Content: Minimum 65 percent.
  3. Shore A Hardness: Minimum 20.
  4. Water resistant.
  5. Mold and mildew resistant.
  6. VOC: Maximum 75 g/L (less water).
  7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  8. Service: Indoor or outdoor.
  9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
  2. Type: S.
  3. Grade: NS.
  4. Class: 25.
  5. Use: O.
  6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg pressure class, positive or negative.

## 2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. 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."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
  - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
  - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
  - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

## 2.6 DUCTWORK FABRICATION

- A. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Provide turning vanes in all mitered elbows.
- C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).
- F. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- G. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

## 2.7 MANUFACTURED DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating

pressures indicated.

- B. Flexible Ducts: Black polymer film supported by helically wound spring steel wire.
  - 1. UL labeled.
  - 2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  - 3. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
  - 4. Maximum Velocity: 4000 fpm.
  - 5. Temperature Range: Minus 20 degrees F to 175 degrees F.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- D. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- E. Install round ducts in maximum practical lengths.
- F. Install ducts with fewest possible joints.
- G. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- H. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- I. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- J. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- K. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- L. 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.

- M. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- N. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."
- O. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- P. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- Q. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- R. Use double nuts and lock washers on threaded rod supports.
- S. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

### 3.2 HANGERS AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Where practical, install concrete inserts before placing concrete.
  - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
  - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where

used.

### 3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 2. Outdoor, Supply-Air Ducts: Seal Class A.
  - 3. Outdoor, Exhaust Ducts: Seal Class C.
  - 4. Outdoor, Return-Air Ducts: Seal Class C.
  - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
  - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
  - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
  - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
  - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
  - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
  - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
  - 12. Conditioned Space, Return-Air Ducts: Seal Class C.
  - 13. All locations, Laboratory Exhaust Ducts: Seal Class A.

### 3.4 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
  - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
  - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
  - 3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after

removal of surface deposits and debris.

### 3.5 SCHEDULES

#### A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
  - a. Pressure Class: Positive 1-inch wg.
  - b. Minimum SMACNA Seal Class: C.
  - c. SMACNA Leakage Class for Rectangular: 12
  - d. SMACNA Leakage Class for Round and Flat Oval: 6.
2. Ducts Connected to Variable-Air-Volume Air-Handling Units:
  - a. Pressure Class: Positive 4-inch wg.
  - b. Minimum SMACNA Seal Class: A.
  - c. SMACNA Leakage Class for Rectangular: 6.
  - d. SMACNA Leakage Class for Round and Flat Oval: 3.

#### B. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
  - a. Pressure Class: Positive or negative 1-inch wg.
  - b. Minimum SMACNA Seal Class: B.
  - c. SMACNA Leakage Class for Rectangular: 12.
  - d. SMACNA Leakage Class for Round and Flat Oval: 6.

#### C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
  - a. Pressure Class: Negative 2-inch wg.
  - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
  - c. SMACNA Leakage Class for Rectangular: 24.
  - d. SMACNA Leakage Class for Round and Flat Oval: 12.

#### D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
  - a. Pressure Class: Positive or negative 2-inch wg.

- b. Minimum SMACNA Seal Class: B.
- c. SMACNA Leakage Class for Rectangular: 12.
- d. SMACNA Leakage Class for Round and Flat Oval: 6.

E. Elbow Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
  - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
  - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and 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: Welded.

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: Spin in.
    - 1) 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.
  - c. Velocity 1000 fpm or Lower: 90-degree tap.
  - d. Velocity 1000 to 1500 fpm: Conical tap.
  - e. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION



## SECTION 23 3300 - AIR DUCT ACCESSORIES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Backdraft dampers - metal.
- C. Duct access doors.
- D. Duct test holes.
- E. Flexible duct connectors.
- F. Volume control dampers.
- G. Miscellaneous products:
  - 1. Duct opening closure film.

#### 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project procedural and administrative requirements.
- B. Division 07 - Thermal and Moisture Protection: Firestopping
- C. Section 23 0005 - Basic HVAC Requirements
- D. Section 23 3100 - HVAC Ducts and Casings.
- E. Section 23 3600 - Air Terminal Units: Pressure regulating damper assemblies.

#### 1.3 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.
- B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations 2021.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

#### 1.4 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

#### 1.5 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

## PART 2 PRODUCTS

### 2.1 AIR TURNING DEVICES/EXTRACTORS

- A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

### 2.2 BACKDRAFT DAMPERS - METAL

- A. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

### 2.3 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.

### 2.4 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

### 2.5 FLEXIBLE DUCT CONNECTORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.

### 2.6 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Single Blade Dampers:
  - 1. Blade: 24 gage, 0.0239 inch, minimum.
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
  - 1. Blade: 18 gage, 0.0478 inch, minimum.
- D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.
- E. Quadrants:
  - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

## 2.7 MISCELLANEOUS PRODUCTS

- A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
  1. Thickness: 2 mils.
  2. High tack water based adhesive.
  3. UV stable light blue color.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

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## SECTION 23 3700 - AIR OUTLETS AND INLETS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Diffusers:
  - 1. Rectangular ceiling diffusers.
- B. Registers/grilles:
  - 1. Ceiling-mounted, egg crate exhaust and return register/grilles.
- C. Roof hoods.

#### 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project procedural and administrative requirements.
- B. Division 09 - Finishes: Painting of ducts and visible behind outlets and inlets.
- C. Section 09 9123 - Interior Painting: Painting of ducts visible behind outlets and inlets.

#### 1.3 REFERENCE STANDARDS

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating 2015.
- B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets 2006 (Reaffirmed 2021).
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

#### 1.4 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

#### 1.5 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Krueger-HVAC: [www.krueger-hvac.com](http://www.krueger-hvac.com).
- B. Price Industries: [www.price-hvac.com](http://www.price-hvac.com).

- C. Titus, a brand of Air Distribution Technologies: [www.titus-hvac.com](http://www.titus-hvac.com).

## 2.2 RECTANGULAR CEILING DIFFUSERS

- A. Type: Provide square, plaque face diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.
- B. Connections: Round.
- C. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.
- D. Fabrication: Steel with baked enamel finish.
- E. Color: As indicated.
- F. Accessories: Provide radial opposed blade and butterfly volume control damper; operating rod extension, anti-smudging device, and gaskets for surface mounted diffusers with damper adjustable from diffuser face.

## 2.3 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

- A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.
- B. Fabrication: Grid core consists of aluminum with mill aluminum finish.
- C. Color: As indicated.
- D. Frame: 1-1/4 inch margin with countersunk screw mounting.
- E. Accessories: Provide integral, gang & face operated opposed blade damper, plaster frame, and 45 degree angled eggcrate or other similar provisions for visual blocking such as angled louver, 90 degree duct elbow, etc..

## 2.4 ROOF HOODS

- A. Manufacturers:
  - 1. Greenheck.
  - 2. Ruskin.
  - 3. Cook.
- B. Fabricate air inlet or exhaust hoods in accordance with SMACNA (DCS).
- C. Fabricate of galvanized steel, minimum 16 gage, 0.0598 inch base and 20 gage, 0.0359 inch hood, or aluminum, minimum 16 gage, 0.0598 inch base and 18 gage, 0.0598 inch hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and factory baked enamel finish.
- D. Fabricate louver penthouses with mitered corners and reinforce with structural angles.
- E. Mount unit on minimum 18 inch high curb base with insulation between duct and curb.

- F. Make hood outlet area minimum of twice throat area.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9123.

END OF SECTION

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SECTION 23 8200 - CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Finned tube radiation.
- B. Convectors.
- C. Unit heaters.
- D. Cabinet unit heaters.
- E. Fan-coil units.

1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project procedural and administrative requirements.
- B. Division 03 - Concrete: Concrete equipment pads.
- C. Section 23 0005 - Basic HVAC Requirements
- D. Section 23 0716 - HVAC Equipment Insulation.
- E. Section 23 0719 - HVAC Piping Insulation.
- F. Section 23 2113 - Hydronic Piping.
- G. Section 23 2300 - Refrigerant Piping.
- H. Section 23 3100 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

- A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Current Edition.
- B. AHRI 440 - Performance Rating of Room Fan-Coils 2008.
- C. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

1.4 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.

- B. Product Data: Provide typical catalog of information including arrangements.
- C. Shop Drawings:
  - 1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
  - 2. Indicate air coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
  - 3. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
- D. Manufacturer's Instructions: Indicate installation instructions and recommendations.
- E. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

### PART 2 PRODUCTS

#### 2.1 FAN-COIL UNITS

- A. Manufacturers:
  - 1. Vertical Cabinet, Horizontal Exposed, or Horizontal Recessed:
    - a. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp: [www.commercial.carrier.com](http://www.commercial.carrier.com).
    - b. Daikin Applied: [www.daikinapplied.com](http://www.daikinapplied.com).
    - c. JCI
    - d. Krueger-HVAC: [www.krueger-hvac.com](http://www.krueger-hvac.com).
    - e. Trane, a brand of Ingersoll Rand: [www.trane.com](http://www.trane.com).
- B. Performance Data and Safety Requirements:
  - 1. Unit capacities certified in accordance with AHRI 440.
  - 2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for

the purpose indicated.

3. Insulation to comply with NFPA 90A requirements for flame spread and smoke generation.
  4. Equipment wiring to comply with requirements of NFPA 70.
- C. Required Directory Listings: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).
- D. Coils:
1. Evenly spaced aluminum fins mechanically bonded to copper tubes.
  2. Water Coil: Suitable for working temperatures not less than 200 degrees F.
  3. Provide drain pan under cooling coil easily removable for cleaning. Provide extended drain pan under coil connections.
- E. Coil Piping Packages:
1. Manufacturers:
    - a. Griswold Controls: [www.griswoldcontrols.com](http://www.griswoldcontrols.com).
    - b. Hays Fluid Controls: [www.haysfluidcontrols.com](http://www.haysfluidcontrols.com).
    - c. IMI Flow Design, a brand of IMI Hydronic Engineering Division of IMI plc: [www.flowdesign.com](http://www.flowdesign.com).
  2. Hoses:
    - a. Provide hoses for all units for connection to main water supply and return headers.
    - b. Length: 2 feet.
    - c. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.
  3. Manual Balancing Valves:
    - a. Brass body for hydronic balancing.
  4. Ball Valves:
    - a. Bronze body for shutoff.
    - b. Provide pressure/temperature ports.
  5. Y Strainers:
    - a. Bronze body.
    - b. "Y" type configuration with brass cap.
    - c. Maximum Operating Pressure: Minimum 450 psi.

- d. Screen: Stainless steel.
- F. Horizontal Recessed Units:
  - 1. Provide with a galvanized steel cabinet, easily removed panels, glass fiber insulation, integral air outlet, and inlet grilles with minimum 18 gage, 0.0478 inch thick sheet steel bottom panel.
  - 2. Ducted Units: Provide with air inlet and outlet duct collars.
- G. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.
- H. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.
- I. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.
- J. Controls:
  - 1. Provide units with control valves furnished by the automatic temperature controls manufacturer.
  - 2. Controls Interface:
    - a. Relay board.
    - b. 24-volt transformer.
- K. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that surfaces are suitable for installation.

#### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's recommendations.
- B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.
- C. Do not damage equipment or finishes.
- D. Unit Heaters:
  - 1. Hang from building structure, with pipe hangers anchored to building, not from piping or electrical conduit.
  - 2. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
- E. Fan-Coil Units:

1. Install as indicated.

F. Units with Hydronic Coils:

1. Provide with shut-off valve on supply piping and tamper-proof, balancing valve with memory stop on return piping.
2. If not easily accessible, extend air vent to exterior surface of cabinet for ease of servicing.

G. Units with Cooling Coils: Connect drain pan to condensate drain.

3.3 FIELD QUALITY CONTROL

- A. Refer to Division 01 - General Requirements for additional requirements.

3.4 CLEANING

- A. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.
- B. Install new filters.

3.5 PROTECTION

- A. Provide finished cabinet units with protective covers during the balance of construction.

END OF SECTION

## SECTION 26 0005 - BASIC ELECTRICAL REQUIREMENTS

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. This section applies to all sections of Division 26 and Division 28.
- B. Drawings and general provisions of the contract, including Division 00 and Division 01 specification sections, apply to work of this section.
- C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
- D. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

#### 1.2 DRAWINGS

- A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
- B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
- C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.
- D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.

#### 1.3 INSPECTION OF SITE

- A. Visit the site, examine and verify the conditions under which the work must be conducted before submitting proposal.
- B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.

#### 1.4 TEMPORARY FACILITIES

- A. Provide and remove upon completion of the project, in accordance with the general conditions, a complete temporary electrical and telephone service during construction.

#### 1.5 ALTERNATES

- A. Refer to Division 01 - General Requirements for procedures.

## 1.6 GUARANTEE

- A. Contractor guarantees that the installation is free from defects and agrees to replace or repair, any part of this installation which becomes defective within a period of one year following final acceptance, unless noted otherwise, provided that such failure is due to defects in the equipment, material or installation or to follow the specifications and drawings. File with the Owner any and all guarantees from the equipment manufacturers.

## 1.7 CODES, PERMITS AND FEES

- A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for electrical work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations. Applicable publications listed in all sections of Division 26 shall be the latest issue, unless otherwise noted.
- B. Rules of local utility companies shall be complied with. Check with the utility company supplying service to the installation and determine all devices including, but not limited to, all current and potential transformers, meter boxes, C.T. cabinets and meters which will be required and include the cost of all such items in proposal.
- C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

## 1.8 STANDARDS OF MATERIAL AND WORKMANSHIP:

- A. All materials shall be new, unless noted otherwise. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable standard specifications of the following recognized authorities:
  - 1. A.N.S.I. - American National Standards Institute
  - 2. A.S.T.M. - American Society for Testing Materials
  - 3. I.C.E.A. - Insulated Cable Engineers Association
  - 4. I.E.E.E. - Institute of Electrical and Electronics Engineers
  - 5. N.E.C. - National Electrical Code (NFPA 70)
  - 6. N.E.C.A. - National Electrical Contractors Association
  - 7. N.E.M.A. - National Electrical Manufacturer's Association
  - 8. N.F.P.A. - National Fire Protection Association
  - 9. U.L. - Underwriters Laboratories, Inc.
- B. Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the Trades involved.
- C. All equipment of the same or similar systems shall be by the same manufacturer.

#### 1.9 RECORD DRAWINGS

- A. Refer to Division 01 - General Requirements for procedures. All literature shall be furnished in accordance with requirements listed in Division 01.
- B. Contractor shall provide the following record drawings as part of the Project closeout document process:
  - 1. Contract Documents, specifications and submittals, indicating "As-Built" conditions and actual products selected for use.
  - 2. Product and Maintenance manuals for all equipment listed within this specification manual and in Contract Documents. Provide with parts lists as applicable.

#### 1.10 SUBMITTALS

- A. Refer to Division 01 - General Requirements for procedures.
- B. Contractor shall provide submittals where items are referred to by symbolic designation on the drawings. All submittals shall bear the same designation (light fixtures, wiring devices, etc.). Refer to other sections of the electrical specifications for additional requirements.
- C. Engineer WILL NOT REVIEW:
  - 1. Submittals not specified.
  - 2. Submittals which do not indicate optional equipment being provided.
  - 3. Submittals not reviewed by Contractor; including Contractor stamp with signature comments.
  - 4. Submittals made after work is delivered to site and/or installed.
  - 5. Submittal resubmissions unless resubmission is required by Architect/Engineer.

#### 1.11 MANUFACTURERS LISTED

- A. The listing of specific manufacturers does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed are not relieved from meeting these specifications in their entirety.
- B. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer five (5) days prior to bid date.

#### 1.12 USE OF EQUIPMENT

- A. The use of any equipment, or any part thereof for purposes other than testing even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor be construed to obligate the Owner in any way to accept improper work or defective materials.
- B. Do not use Owner's light fixtures for temporary lighting except as allowed and directed by the Owner.



PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 INSTALLATION OF EQUIPMENT

- A. Install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the Architect/Engineer for resolution.
- B. Equipment location shall be as close as practical to locations shown on the drawings.
- C. Working clearances shall not be less than specified in NFPA 70 (National Electric Code).

3.2 COORDINATION

- A. Install work to avoid interference with work of other trades including, but not limited to, architectural and mechanical trades. Remove and relocate any work that causes an interference at Contractor's expense. Disputes regarding the cause of an interference will be resolved by the Construction Manager or Architect/Engineer.

3.3 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

- A. Refer to Division 01 - General Requirements and Division 02 - Existing Conditions.
- B. All cutting, patching and repair work shall be performed by the contractor through approved, qualified subcontractors. Contractor shall include full cost of same in bid.

3.4 EQUIPMENT CONNECTIONS

- A. Make connections to equipment, motors, lighting fixtures, and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. All additional connections not shown on the drawings, but called out by the equipment manufacturer's shop drawings shall be provided.

3.5 ACCESS DOORS AND PANELS

- A. Refer to Division 08 - Openings; Provide access doors in locations as required per N.E.C. Coordinate locations with architectural trades.

3.6 CLEANING

- A. Refer to Division 01 - General Requirements; All equipment shall be cleaned as frequently as necessary through the construction process and again prior to project completion.
- B. Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

3.7 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT AND MATERIALS

- A. Refer to Division 01 - General Requirements; All equipment and materials shall be delivered, stored and secured per manufacturer's recommendations.

- B. On-site storage shall be coordinated with Construction Manager and be performed in a manner as to avoid damage, deterioration and loss.

3.8 DRAWINGS AND MEASUREMENTS

- A. Electrical drawings are not intended to be scaled for rough-in measurements nor to serve as submittals. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor.

END OF SECTION

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## SECTION 26 0505 - SELECTIVE DEMOLITION FOR ELECTRICAL

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Electrical demolition and extension of existing electrical work.

#### 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements.
- C. Section 26 0005 - Basic Electrical Requirements.

### PART 2 PRODUCTS

#### 2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Beginning of demolition means installer accepts existing conditions.

#### 3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

#### 3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
  - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
  - 2. PCB- and DEHP-containing lighting ballasts.
  - 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- G. Repair adjacent construction and finishes damaged during demolition and extension work.
- H. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

#### 3.4 CLEANING AND REPAIR

- A. See Division 01 - General Requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

## SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Cable ties.
- F. Firestop sleeves.

## 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.
- C. Section 07 8400 - Firestopping.
- D. Section 26 0005 - Basic Electrical Requirements.
- E. Section 26 0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- F. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

## 1.3 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

- F. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC) 2012.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- L. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- M. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- N. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.
- O. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.5 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

#### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.7 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

## PART 2 PRODUCTS

### 2.1 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is permitted only as follows:
  - 1. Where not otherwise restricted, may be used:
    - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
      - 1) Maximum Length: 6 feet.
    - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
- H. Manufactured wiring systems are not permitted.

### 2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:



1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
  3. Tinned Copper Conductors: Comply with ASTM B33.
- H. Minimum Conductor Size:
1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
- I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- J. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  2. Color Coding Method: Integrally colored insulation.
  3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
      - 4) Neutral/Grounded: Gray.
    - b. 208Y/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral/Grounded: White.
    - c. Equipment Ground, All Systems: Green.

- d. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

## 2.3 SINGLE CONDUCTOR BUILDING WIRE

### A. Manufacturers:

#### 1. Copper Building Wire:

- a. Cerro Wire LLC: [www.cerrowire.com](http://www.cerrowire.com).
- b. Encore Wire Corporation: [www.encorewire.com](http://www.encorewire.com).
- c. General Cable Technologies Corporation: [www.generalcable.com](http://www.generalcable.com).
- d. Southwire Company: [www.southwire.com](http://www.southwire.com).

### B. Description: Single conductor insulated wire.

### C. Conductor Stranding:

#### 1. Feeders and Branch Circuits:

- a. Size 10 AWG and Smaller: Stranded.
- b. Size 8 AWG and Larger: Stranded.

### D. Insulation Voltage Rating: 600 V.

### E. Insulation:

- 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

## 2.4 METAL-CLAD CABLE

### A. Manufacturers:

- 1. AFC Cable Systems Inc: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).
- 2. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
- 3. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).

### B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

### C. Conductor Stranding:

- 1. Size 10 AWG and Smaller: Stranded.
- 2. Size 8 AWG and Larger: Stranded.

### D. Insulation Voltage Rating: 600 V.

- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Provide oversized neutral conductors where indicated or required.
- G. Grounding: Full-size integral equipment grounding conductor.
- H. Armor: Steel, interlocked tape.

## 2.5 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
- C. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
  - 4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

### 3.3 INSTALLATION

#### A. Circuiting Requirements:

- 1. Unless dimensioned, circuit routing indicated is diagrammatic.
- 2. When circuit destination is indicated without specific routing, determine exact routing required.
- 3. Arrange circuiting to minimize splices.
- 4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
- 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
- 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
- 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
- 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

#### B. Install products in accordance with manufacturer's instructions.

#### C. Perform work in accordance with NECA 1 (general workmanship).

#### D. Install metal-clad cable (Type MC) in accordance with NECA 120.

#### E. Installation in Raceway:

- 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.
  3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- G. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- H. Install conductors with a minimum of 12 inches of slack at each outlet.
- I. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  3. Do not remove conductor strands to facilitate insertion into connector.
  4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.
- P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

#### 3.4 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

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SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, repairs.
- C. Section 26 0005 - Basic Electrical Requirements
- D. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
  - 3. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.



## 1.5 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.
- B. Project Record Documents: Record actual locations of grounding electrode system components and connections.

## PART 2 PRODUCTS

### 2.1 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
- F. Bonding and Equipment Grounding:
  - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
  - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

## 2.2 GROUNDING AND BONDING COMPONENTS

### A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

### B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:

1. Use insulated copper conductors unless otherwise indicated.
  - a. Exceptions:
    - 1) Use bare copper conductors where installed underground in direct contact with earth.
    - 2) Use bare copper conductors where directly encased in concrete (not in raceway).

### C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
4. Manufacturers - Mechanical and Compression Connectors:
  - a. Advanced Lightning Technology (ALT): [www.altfab.com](http://www.altfab.com)
  - b. Burndy LLC: [www.burndy.com](http://www.burndy.com)
  - c. Harger Lightning & Grounding: [www.harger.com](http://www.harger.com)
  - d. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com)
5. Manufacturers - Exothermic Welded Connections:
  - a. Burndy LLC: [www.burndy.com](http://www.burndy.com)
  - b. Cadweld, a brand of Erico International Corporation: [www.erico.com](http://www.erico.com)

- c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC:  
www.thermoweld.com

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
  - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 0553.

#### 3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.13.

END OF SECTION

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, and cutting and patching requirements.
- C. Section 26 0005 - Basic Electrical Requirements
- D. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- E. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- F. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.3 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- D. MFMA-4 - Metal Framing Standards Publication 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Division 03.

1.5 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
  - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  2. Conduit Clamps: Bolted type unless otherwise indicated.
  3. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com](http://www.cooperindustries.com)
    - b. Erico International Corporation: [www.erico.com](http://www.erico.com)
    - c. HoldRite, a brand of Reliance Worldwide Corporation: [www.holdrite.com](http://www.holdrite.com)
    - d. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com](http://www.emerson.com)
    - e. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com)
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
1. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
    - b. Erico International Corporation: [www.erico.com/#sle](http://www.erico.com/#sle).
    - c. HoldRite, a brand of Reliance Worldwide Corporation: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).
    - d. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - e. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
  2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
  3. Manufacturers:
    - a. Cooper B-Line, a division of Eaton Corporation: [www.cooperindustries.com](http://www.cooperindustries.com)
    - b. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com)
    - c. Unistrut, a brand of Atkore International Inc: [www.unistrut.com](http://www.unistrut.com)
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
    - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.

- c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
- d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
- e. Outlet Boxes: 1/4 inch diameter.
- f. Luminaires: 1/4 inch diameter.

F. Anchors and Fasteners:

- 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad constructed in accordance with Division 03.
  - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Conduit Support and Attachment: Also comply with Section 26 0533.13.
- I. Box Support and Attachment: Also comply with Section 26 0533.16.
- J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

3.2 FIELD QUALITY CONTROL

A. See Division 01 - General Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION



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SECTION 26 0533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Aluminum rigid metal conduit (RMC).
- C. Flexible metal conduit (FMC).
- D. Electrical metallic tubing (EMT).
- E. Rigid polyvinyl chloride (PVC) conduit.
- F. Conduit fittings.
- G. Accessories.

1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.
- C. Division 07 - Thermal and Moisture Protection: Firestopping.
- D. Section 07 8400 - Firestopping.
- E. Section 26 0005 - Basic Electrical Requirements
- F. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- G. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- H. Section 26 0529 - Hangers and Supports for Electrical Systems.
- I. Section 26 0533.16 - Boxes for Electrical Systems.
- J. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- K. Section 28 4600 - Fire Detection and Alarm: Fire alarm wiring in conduit.

1.3 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.

- E. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit 2004.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit 2018.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.
- K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.

## PART 2 PRODUCTS

### 2.1 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- D. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- E. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- F. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- G. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

- H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- I. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
  - 1. Maximum Length: 6 feet.
- J. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

## 2.2 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
  - 2. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

## 2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
  - 1. Allied Tube & Conduit: [www.alliedeg.com](http://www.alliedeg.com)
  - 2. Republic Conduit: [www.republic-conduit.com](http://www.republic-conduit.com)
  - 3. Wheatland Tube, a Division of Zekelman Industries: [www.wheatland.com](http://www.wheatland.com)
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
  - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

## 2.4 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:

1. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com)
2. Electri-Flex Company: [www.electriflex.com](http://www.electriflex.com)
3. International Metal Hose: [www.metalhose.com](http://www.metalhose.com)

B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

## 2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: [www.alliedeg.com](http://www.alliedeg.com)
2. Republic Conduit: [www.republic-conduit.com](http://www.republic-conduit.com)
3. Wheatland Tube, a Division of Zekelman Industries: [www.wheatland.com](http://www.wheatland.com)

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression (gland) or set-screw type.
  - a. Do not use indenter type connectors and couplings.
4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

## 2.6 ACCESSORIES

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- B. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- C. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- D. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

- E. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated without specific routing, determine exact routing required.
  - 3. Conceal all conduits unless specifically indicated to be exposed.
  - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
  - 5. Unless otherwise approved, do not route conduits exposed:
    - a. Across floors.
    - b. Across roofs.
  - 6. Arrange conduit to maintain adequate headroom, clearances, and access.
  - 7. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
  - 8. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
- E. Conduit Support:
  - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
  - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
7. Use of wire for support of conduits is not permitted.

F. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
5. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
6. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

G. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.

6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  7. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.
- H. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where conduits are subject to earth movement by settlement or frost.
- I. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
  2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- J. Provide grounding and bonding in accordance with Section 26 0526.
- K. Identify conduits in accordance with Section 26 0553.

### 3.3 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION



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SECTION 26 0533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Floor boxes.

1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 03 - Concrete: Concrete.
- C. Division 07 - Thermal and Moisture Protection: Firestopping.
- D. Division 08 - Openings: Access Doors.
- E. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- F. Section 26 0005 - Basic Electrical Requirements.
- G. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- H. Section 26 0529 - Hangers and Supports for Electrical Systems.
- I. Section 26 0533.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- J. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- K. Section 26 2726 - Wiring Devices:
  - 1. Wall plates.
  - 2. Floor box service fittings.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.

- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specification for Underground Enclosure Integrity 2017.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.5 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
  - 1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Product Requirements, for additional provisions.
  - 2. Keys for Lockable Enclosures: Two of each different key.

## PART 2 PRODUCTS

### 2.1 BOXES

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
  - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  - 3. Use suitable concrete type boxes where flush-mounted in concrete.
  - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
  - 6. Use shallow boxes where required by the type of wall construction.
  - 7. Do not use "through-wall" boxes designed for access from both sides of wall.

8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  12. Wall Plates: Comply with Section 26 2726.
  13. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com](http://www.cooperindustries.com)
    - b. Hubbell Incorporated; Bell Products: [www.hubbell-rtb.com](http://www.hubbell-rtb.com)
    - c. Hubbell Incorporated; RACO Products: [www.hubbell-rtb.com](http://www.hubbell-rtb.com)
    - d. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com](http://www.emerson.com)
    - e. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com)
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    - b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    - b. Back Panels: Painted steel, removable.
    - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
- D. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 2726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.

2. Use cast iron floor boxes within slab on grade.
3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
4. Manufacturer: Same as manufacturer of floor box service fittings.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
  1. Locate boxes to be accessible. Provide access panels in accordance with Division 08 as required where approved by the Architect.
  2. Unless dimensioned, box locations indicated are approximate.
  3. Locate boxes as required for devices installed under other sections or by others.
  4. Locate boxes so that wall plates do not span different building finishes.
  5. Locate boxes so that wall plates do not cross masonry joints.
  6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
  7. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

- a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
8. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
- I. Box Supports:
    1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
    2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  - J. Install boxes plumb and level.
  - K. Flush-Mounted Boxes:
    1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
    2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
    3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
  - L. Install boxes as required to preserve insulation integrity.
  - M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
  - N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
  - O. Close unused box openings.
  - P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
  - Q. Provide grounding and bonding in accordance with Section 26 0526.
- ### 3.3 PROTECTION
- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 0533.23 - SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface raceway systems.

1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements.
- C. Section 26 0005 - Basic Electrical Requirements.
- D. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- E. Section 26 0529 - Hangers and Supports for Electrical Systems.
- F. Section 26 0533.13 - Conduit for Electrical Systems.
- G. Section 26 0533.16 - Boxes for Electrical Systems.
- H. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- I. Section 26 2726 - Wiring Devices: Receptacles.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 5 - Surface Metal Raceways and Fittings Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate rough-in locations of outlet boxes provided under Section 26 0533.16 and conduit provided under Section 26 0533.13 as required for installation of raceways provided under this section.
  - 3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.



B. Sequencing:

1. Do not install raceways until final surface finishes and painting are complete.
2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
  1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

PART 2 PRODUCTS

2.1 RACEWAY REQUIREMENTS

- A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.2 SURFACE RACEWAY SYSTEMS

- A. Manufacturers:
  1. Hubbell Incorporated: [www.hubbell.com](http://www.hubbell.com)
  2. MonoSystems, Inc: [www.monosystems.com](http://www.monosystems.com)
  3. Wiremold, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- B. Surface Metal Raceways: Listed and labeled as complying with UL 5.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.
- C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.

- D. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install raceways plumb and level.
- D. Secure and support raceways in accordance with Section 26 0529 at intervals complying with NFPA 70 and manufacturer's requirements.
- E. Close unused raceway openings.
- F. Provide grounding and bonding in accordance with Section 26 0526.

END OF SECTION

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## SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Warning signs and labels.

#### 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 09 - Finishes: Interior and Exterior Painting.
- C. Section 09 9123 - Interior Painting.
- D. Section 26 0005 - Basic Electrical Requirements
- E. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- F. Section 26 2726 - Wiring Devices: Device and wallplate finishes; factory pre-marked wallplates.

#### 1.3 REFERENCE STANDARDS

- A. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

#### 1.4 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

### PART 2 PRODUCTS

#### 2.1 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Enclosed switches, circuit breakers, and motor controllers:

- 1) Identify voltage and phase.
  - 2) Identify power source and circuit number. Include location when not within sight of equipment.
  - 3) Identify load(s) served. Include location when not within sight of equipment.
2. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
  3. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
- C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
  2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- D. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
  2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
    - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
      - 1) Color Code:
        - (a) Fire Alarm System: Red.
      - 2) Field-Painting: Comply with Section 09 9123 and 09 9113.
      - 3) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
  3. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.
- E. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
  2. Use voltage markers or color coded boxes to identify systems other than normal power system.
    - a. Color-Coded Boxes: Field-painted in accordance with Division 09 per the same color code used for raceways.
- F. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
2. Use identification label to identify fire alarm system devices.
  - a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
3. Use identification label to identify serving branch circuit for all receptacles.
  - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

G. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

## 2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
  - a. Indoor Clean, Dry Locations: Use plastic nameplates.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

D. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.

2. Legend: Power source and circuit number or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Black text on clear background.
- E. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
  2. Legend: Designation indicated and device zone or address.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Red text on white background.

## 2.3 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
  2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
  3. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- D. Legend:
1. Markers for Voltage Identification: Highest voltage present.
  2. Markers for System Identification:
- E. Color: Black text on orange background unless otherwise indicated.

## 2.4 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
1. Materials:
    - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
  2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
  2. Flush-Mounted Equipment: Inside of equipment door.
  3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  4. Elevated Equipment: Legible from the floor or working platform.
  5. Interior Components: Legible from the point of access.
  6. Conduits: Legible from the floor.
  7. Boxes: Outside face of cover.
  8. Conductors and Cables: Legible from the point of access.
  9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Secure rigid signs using stainless steel screws.



G. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

SECTION 26 0935 - DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Distributed Digital Lighting Control System
- B. Digital Load Controllers (Room and Fixture Controllers)
- C. Digital Wall or Ceiling Mounted Occupancy Sensor
- D. Digital Wall Switch Occupancy Sensors
- E. Digital Wall Switches

1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Section 26 0005 - Basic Electrical Requirements.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 0533.13 - Conduit for Electrical Systems.
- E. Section 26 0533.16 - Boxes for Electrical Systems.
- F. Section 26 0553 - Identification for Electrical Systems.
- G. Section 26 2726 - Wiring Devices.
- H. Section 26 5100 - Interior Lighting.

1.3 REFERENCE STANDARDS

- A. FCC Article 15, Section J, Class A.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- C. NEMA WD 7 - Occupancy Motion Sensors Standard; Current Edition.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- E. NFPA 70 - National Electrical Code; Most recent edition adopted by Authority Having Jurisdiction, including all applicable Amendments and Supplements.
- F. UL 508 - Standard for Industrial Control Equipment; Current Edition, including all Revisions.
- G. UL 916 - Standard for Energy Management Equipment; Current Edition, including all Revisions.
- H. UL 924 - Standard for Emergency Lighting and Power Equipment

- I. UL 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products Installed in Air-Handling Spaces.

#### 1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Digital lighting control system shall accommodate the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories that suit the required lighting and electrical system parameters.
- B. System shall comply with FCC emission standards specified in part 15, sub-part J for commercial and residential application.

#### 1.5 ADMINISTRATIVE REQUIREMENTS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 - General Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Catalog sheets and specifications.
  - 2. Ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
  - 3. Storage and handling requirements and recommendations.
  - 4. Installation instructions.
- C. Shop Drawings: Wiring diagrams a for the various components of the System specified including:
  - 1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
  - 2. Show location of all devices, including at minimum sensors, load controllers, and switches/dimmers for each area on reflected ceiling plans.
  - 3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.
  - 4. Network riser diagram including floor and building level details. Include network cable specification. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Closeout Submittals:
  - 1. Project Record Documents: Record actual installed locations and settings for lighting control devices.
  - 2. Operation and Maintenance Manual:

- a. Include approved Shop Drawings and Product Data.
- b. Include Sequence of Operation, identifying operation for each room or space.
- c. Include manufacturer's maintenance information.
- d. Operation and Maintenance Data: Include detailed information on device programming and setup.
- e. Include startup and test reports.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing of centralized and distributed lighting control systems with a minimum of 10 years documented experience.
- B. Installer Qualifications: Company certified by the manufacturer and specializing in installation of networked lighting control products with minimum three years documented experience.
- C. System Components: Demonstrate that individual components have undergone quality control and testing prior to shipping.

#### 1.7 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to commencing Work of this section. Meeting to be attended by Contractor, Architect, system installer, factory authorized manufacturer's representative, and representative of all trades related to the system installation.
- B. Review installation procedures and coordination required with related Work and the following:
  1. Confirm the location and mounting of all devices, with special attention to placement of switches, dimmers, and any sensors.
  2. Review the specifications for low voltage control wiring and termination.
  3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.
  4. Discuss requirements for integration with other trades
- C. Inspect and make notes of job conditions prior to installation:
  1. Record minutes of the conference and provide copies to all parties present.
  2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
  3. Installation shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

#### 1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under

environmental conditions outside manufacturer's absolute limits.

- B. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
  - 1. Ambient temperature: 32 to 104 degrees F (0 to 40 degrees C).
  - 2. Relative humidity: Maximum 90 percent, non-condensing.

## 1.9 WARRANTY

- A. Manufacturer shall provide a 5 year limited warranty on products within this installation, except where otherwise noted, and consisting of a one for one device replacement.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Lutron
  - 2. Wattstopper (Legrand)
  - 3. Eaton Greengate
  - 4. nLight (Acuity Brands)
  - 5. Crestron
  - 6. Leviton
  - 7. Enlighted (Siemens)
  - 8. Touche Lighting Control
  - 9. Engineer pre-approved equal.

### 2.2 DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

- A. System General: Provide digital lighting control system complete with all necessary enclosures, wiring, and system components to ensure a complete and properly functioning system as indicated on the Drawings and specified herein. If a conflict is identified, between the Drawing, this specification, contact the Engineer for clarification prior to proceeding.
  - 1. Space Control Requirements: Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality as indicated in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.

2. Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four preset lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to turn off all lighting in the space. Spaces with up to four moveable walls shall include controls that can be reconfigured when the room is partitioned.
- B. Equipment Required: Lighting Control and Automation system as defined under this section covers the following equipment.
1. Digital Lighting Management (DLM) local network: Free topology, plug-in wiring system for power and data to room devices.
  2. Digital Fixture Controllers: Self-configuring, digitally addressable one relay fixture-integrated controllers for on/off/0-10V dimming control.
  3. Digital Occupancy Sensors: Self-configuring, digitally addressable, calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.
  4. Digital Switches: Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.
- C. Local Network: Digital lighting control local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.
1. Features of the digital lighting control local network include:
    - a. Automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
    - b. Simple replacement of any device in the local digital lighting control network with a standard off the shelf unit without requiring significant commissioning, configuration or setup.
    - c. Ability to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
    - d. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.
  2. Digital room devices connect to the local network using pre-terminated low voltage cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.
  3. If manufacturer's pre-terminated low voltage cables are not used for the installation each cable must be individually tested and observed by authorized service representative following installation.

4. Provide input from fire alarm system. Upon receipt of signal from fire alarm system the lighting control system shall override all lighting controls and provide full illumination to all emergency fixtures along the path of egress for a minimum of 90 minutes or until fire alarm system is reset.

## 2.3 DIGITAL LOAD CONTROLLERS (ROOM AND FIXTURE CONTROLLERS)

- A. Digital Load Controllers: Digital controllers for lighting zones, fixtures and/or plug loads automatically bind room loads to the connected control devices in the space without commissioning or the use of any tools. Provide controllers to match the room lighting and plug load control requirements. Controllers are simple to install, and do not have dip switches/potentiometers, or require special configuration for standard applications. Control units include the following features
  1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
  2. Simple replacement using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf device.
  3. Multiple room controllers connected together in a local network must automatically arbitrate with each other, without requiring any configuration or setup, so that individual load numbers are assigned starting with load 1 to a maximum of 64, assigned based on each controller's device ID's from highest to lowest.
  4. Device Status LEDs to indicate:
    - a. Data transmission
    - b. Device has power
    - c. Status for each load
    - d. Configuration status
  5. Quick installation features including:
    - a. Standard junction box mounting
    - b. Quick low voltage connections using standard RJ-45 patch cable
  6. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power:
    - a. Turn on to 100 percent
    - b. Turn off
    - c. Turn on to last level
  7. Each load be configurable to operate in the following sequences based on occupancy:
    - a. Auto-on/Auto-off (Follow on and off)

- b. Manual-on/Auto-off (Follow off only)
8. Polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.
9. BACnet object information shall be available for the following objects:
  - a. Load status
  - b. Schedule state, normal or after-hours
  - c. Demand Response enable and disable
  - d. Room occupancy status
  - e. Total room lighting and plug loads watts
  - f. Electrical current
  - g. Total watts per controller
  - h. Total room watts/sq ft.
  - i. Force on/off all loads
10. UL 2043 plenum rated
11. Manual override and LED indication for each load
12. Zero cross circuitry for each load
13. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.
14. Dimming Room Controllers shall share the following features:
  - a. Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.
  - b. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.
  - c. The following dimming attributes may be changed or selected using a wireless configuration tool:
    - 1) Establish preset level for each load from 0-100 percent
    - 2) Set high and low trim for each load
    - 3) Initiate lamp burn in for each load of either 0, 12 or 100 hours



- d. Override button for each load provides the following functions:
  - 1) Press and release for on/off control
  - 2) Press and hold for dimming control
- e. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver. LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim.
- f. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100 percent dimming range defined by the minimum and maximum calibration trim.
- g. Calibration and trim levels must be set per output channel. Devices that set calibration or trim levels per controller (as opposed to per load) are not acceptable.
- h. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

B. Fixture Controllers shall include

- 1. A form factor and product ratings to allow various OEM fixture manufacturers to mount the device inside the ballast/driver cavity of standard-sized fluorescent or LED general lighting fixtures.
- 2. One 3A 120/277V rated mechanically held relay.
- 3. Programmable behavior on power up following the loss of normal power:
  - a. Turn on to 100 percent
  - b. Turn off
  - c. Turn on to last level
- 4. Requirement for 7 mA of 24VDC operating power from the digital lighting control local network.
- 5. Fixture Controller does not require a connection to a neutral conductor to operate, and unlike other types of Load Controllers it does not contribute power to the digital lighting control local network to drive accessory devices.
- 6. Power to drive the fixture controller electronics can come from any room controller
- 7. 0-10V dimming capability via a single 0-10 volt analog output from the device for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Fixture Controller.
- 8. Connect to a single or dual RJ-45 adaptor with 24 inch leads. Single adaptor mounts in a 1/2 inch KO and dual adaptor in a 2.2 by 1.32 inch rectangular hole for connection to the digital lighting control local network.

9. Adaptor leads are insulated for use in a fixture cavity, and the lead length allows the OEM fixture manufacturer flexibility to position the Fixture Controller and the RJ45 jack in the best locations on each fixture.
10. A complete set of dimming features described above in the paragraph detailing On/Off/Dimming Enhanced Room Controllers.

#### 2.4 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR

- A. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
  1. Digital calibration and pushbutton configuration for the following variables:
    - a. Sensitivity, 0-100 percent in 10 percent increments
    - b. Time delay, 1-0 minutes in 1 minute increments
    - c. Test mode, Five second time delay
    - d. Detection technology, PIR, Ultrasonic or Dual Technology activation and/or re-activation.
    - e. Walk-through mode
  2. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the digital lighting control local network.
  3. Programmable control functionality including:
    - a. Each sensor may be programmed to control specific loads within a local network.
    - b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
    - c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.
    - d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
      - e. Ultrasonic and Passive Infrared
      - f. Ultrasonic or Passive Infrared
      - g. Ultrasonic only
      - h. Passive Infrared only
      - i. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.

4. One or two RJ-45 port(s) for connection to digital lighting control local network.
  5. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
  6. Device Status LEDs, which may be disabled for selected applications, including:
    - a. PIR detection
    - b. Ultrasonic detection
    - c. Configuration mode
    - d. Load binding
  7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
  8. Manual override of controlled loads.
  9. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.
- B. BACnet object information shall be available for the following objects:
1. Detection state
  2. Occupancy sensor time delay
  3. Occupancy sensor sensitivity, PIR and Ultrasonic
- C. Units shall not have any dip switches or potentiometers for field settings
- D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology digital lighting control local network. No additional configuration will be required.

## 2.5 DIGITAL WALL SWITCH OCCUPANCY SENSORS

- A. Digital Occupancy Sensors shall provide scrolling LCD display for digital calibration and electronic documentation. Features include the following:
1. Digital calibration and pushbutton configuration for the following variables:
    - a. Sensitivity: 0-100 percent in 10 percent increments
    - b. Time delay: 1-30 minutes in 1 minute increments
    - c. Test mode: Five second time delay
    - d. Detection technology: PIR, Dual Technology activation and/or re-activation.
    - e. Walk-through mode

- f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the digital lighting control local network.
2. Programmable control functionality including:
  - a. Each sensor may be programmed to control specific loads within a local network.
  - b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
  - c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time (default 10 seconds) after turning off.
  - d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
    - 1) Ultrasonic and Passive Infrared
    - 2) Ultrasonic or Passive Infrared
    - 3) Ultrasonic only
    - 4) Passive Infrared only
3. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.
4. Two RJ-45 ports for connection to digital lighting control local network.
5. Two-way infrared (IR) transceiver to allow remote programming through handheld configuration tool and control by remote personal controls.
6. Device Status LEDs including
  - a. PIR detection
  - b. Ultrasonic detection
  - c. Configuration mode
  - d. Load binding
7. Assignment of any occupancy sensor to a specific load within the room without wiring or special tools.
8. Assignment of local buttons to specific loads within the room without wiring or special tools
9. Manual override of controlled loads
10. All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile FLASH memory within the wall switch sensor itself. Memory shall

have an expected life of no less than 10 years.

- B. BACnet object information shall be available for the following objects:
  - 1. Detection state
  - 2. Occupancy sensor time delay
  - 3. Occupancy sensor sensitivity, PIR and Ultrasonic
  - 4. Button state
  - 5. Switch lock control
  - 6. Switch lock status
- C. Units shall not have any dip switches or potentiometers for field settings.
- D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology digital lighting control local network. No additional configuration will be required.
- E. Two-button wall switch occupancy sensors, when connected to a single relay dimming room or fixture controller, shall operate in the following sequence as a factory default:
  - 1. Left button
    - a. Press and release - Turn load on
    - b. Press and hold - Raise dimming load
  - 2. Right button
    - a. Press and release - Turn load off
    - b. Press and hold - Lower dimming load
- F. Low voltage momentary pushbuttons shall include the following features:
  - 1. Load/Scene Status LED on each switch button with the following characteristics:
    - a. Bi-level LED
    - b. Dim locator level indicates power to switch
    - c. Bright status level indicates that load or scene is active
  - 2. The following button attributes may be changed or selected using a wireless configuration tool:
    - a. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
    - b. Individual button function may be configured to Toggle, On only or Off only.
    - c. Individual scenes may be locked to prevent unauthorized change.

- d. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
- e. Ramp rate may be adjusted for each dimmer switch.
- f. Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependent; each button may be bound to multiple loads.

## 2.6 DIGITAL WALL SWITCHES

- A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 6 button configuration. Wall switches shall include the following features:
  - 1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
  - 2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
  - 3. Configuration LED on each switch that blinks to indicate data transmission.
  - 4. Load/Scene Status LED on each switch button with the following characteristics:
    - a. Bi-level LED
    - b. Dim locator level indicates power to switch
    - c. Bright status level indicates that load or scene is active
    - d. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
  - 5. Programmable control functionality including:
    - a. Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority
    - b. Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
  - 6. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.
- B. BACnet object information shall be available for the following objects:
  - 1. Button state
  - 2. Switch lock control
  - 3. Switch lock status
- C. Two RJ-45 ports for connection to digital lighting control local network.

- D. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology digital lighting control local network. No additional configuration shall be required to achieve multi-way switching.
- E. Load and Scene button function may be reconfigured for individual buttons from Load to Scene, and vice versa.
  - 1. Individual button function may be configured to Toggle, On only or Off only.
  - 2. Individual scenes may be locked to prevent unauthorized change.
  - 3. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
  - 4. Ramp rate may be adjusted for each dimmer switch.
  - 5. Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependent; each button may be bound to multiple loads.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Do not begin installation until measurements have been verified and work areas have been properly prepared.
- B. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that required pre-installation meeting specified in Part 1 of this specification has been completed, recorded meeting minutes have been distributed and all outstanding issues noted have been resolved prior to the start of installation.

#### 3.2 INSTALLATION

- A. Install system in accordance with the approved system shop drawings and manufacturer's instructions.
- B. All wiring associated with the specified controls system shall be installed within conduit or conduits unless otherwise indicated on the Drawings. Refer to 26 0533.13 - Conduit for Electrical Systems for requirements.
- C. Install all room/area devices using manufacturer's factory-tested low voltage cable with pre-terminated RJ-45 connectors.
  - 1. If pre-terminated cable is not used for room/area wiring, each field-terminated cable shall be tested following installation and testing results submitted to the Manufacturer's Representative for approval prior to proceeding with the Work.
  - 2. If fixtures have internal digital lighting control Control Modules, ensure that they are also connected with low voltage cable.

3. Install all room to room network devices using manufacturer-supplied network wire or wireless devices. Network wire substitution is not permitted and may result in loss of product warranty.
  4. Low voltage wiring topology must comply with manufacturer's specifications.
  5. Route network wiring as indicated on the Drawings as closely as possible. Document final wiring location, routing and topology on as built drawings.
  6. All lighting control low voltage wiring jacket colors shall be coordinated with and approved by Owner.
    - a. If there is no selection provided by Owner, jacket color shall be yellow.
- D. All line voltage connections shall be tagged to indicate circuit and switched legs.
- E. Test all devices to ensure proper communication.
- F. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted while occupied.
- G. Provide written or computer-generated documentation on the configuration of the system including room by room description including:
1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
  2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
  3. Load Parameters (e.g. blink warning, etc.)
- H. Post start-up tuning - Adjust sensor time delays and sensitivities to meet the Owner's requirements 30 days from beneficial occupancy. Provide a detailed report to the Architect / Owner of post start-up activity.
- I. Tighten all panel Class I conductors from both circuit breaker and to loads to torque ratings as marked on enclosure UL label.
- J. All Class II cabling shall enter enclosures from within low-voltage wiring areas and shall remain within those areas. No Class I conductors shall enter a low-voltage area.
- K. Run separate neutrals for any phase dimmed branch load circuit. Different types of dimming loads shall have separate neutral.
- L. Verify all non-panel-based lighting loads to be free from short circuits prior to connection to room controllers.

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Notify Engineer and Manufacturer in writing a minimum of 3 weeks prior to system start-up and testing.



- B. Tests and Inspections: Manufacturer's service representative shall perform the following inspections and prepare reports.
1. Verify Class I and II wiring connections are terminated properly by validating system performance.
  2. Set IP addresses and other network settings of system front end hardware per facilities IT instructions.
  3. Verify / complete task programming for all switches, dimmers, time clocks, and sensors.
  4. Verify that the control of each space complies with the Sequence of Operation.
  5. Correct any system issues and re-test.
- C. Provide a report in table format with drawings, or using a software file that can be opened in the manufacturer's system software including each room or space that has lighting control installed. Indicate the following:
1. Date of test or inspection.
  2. Loads per space, or Fixture Address identification.
  3. Quantity and Type of each device installed
  4. Reports providing each device's settings.

### 3.4 DEMONSTRATION AND TRAINING

- A. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Set-up, starting of the lighting control system and Owner instruction includes:
1. Confirmation of entire system operation and communication to each device.
  2. Confirmation of operation of individual relays, switches, and sensors.
  3. Confirmation of system Programming, photocell settings, override settings, etc.
  4. Provide training to cover installation, programming, operation, and troubleshooting of the lighting control system.

### 3.5 PRODUCT SUPPORT AND SERVICE

- A. Factory telephone support shall be available at no cost to the Owner following acceptance. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

END OF SECTION

## SECTION 26 2726 - WIRING DEVICES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.
- D. Floor box service fittings.

#### 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.
- C. Section 26 0005 - Basic Electrical Requirements.
- D. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- E. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- F. Section 26 0533.16 - Boxes for Electrical Systems.
- G. Section 26 0533.23 - Surface Raceways for Electrical Systems: Surface raceway systems, including multioutlet assemblies.
- H. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- I. Section 26 0583 - Wiring Connections: Cords and plugs for equipment.
- J. Section 26 0953 - Distributed Digital Lighting Controls

#### 1.3 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2017h.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification) 2017g.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2015).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2016.

- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.
- L. UL 1310 - Class 2 Power Units Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

##### B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

#### 1.5 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

### PART 2 PRODUCTS

#### 2.1 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide tamper resistant receptacles for receptacles installed in areas listed below:
  - 1. All 15 and 20-ampere 125 and 250-volt nonlocking type receptacles in the areas listed below shall be listed tamper-resistant receptacles, unless otherwise excluded in NEC.
- E. Provide GFCI protection for receptacles installed within 6 feet of sinks.
- F. Provide GFCI protection for receptacles installed in kitchens.
- G. Provide GFCI protection for receptacles serving electric drinking fountains.
  - 1. Outlet shall be readily accessible.
- H. Provide GFCI protection for outlets serving vending machines. Outlets shall be readily accessible.

## 2.2 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with stainless steel wall plate.

## 2.3 WALL SWITCHES

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

## 2.4 RECEPTACLES

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell.com](http://www.hubbell.com)
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com)
  - 3. Lutron Electronics Company, Inc; Designer Style: [www.lutron.com](http://www.lutron.com)
  - 4. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.

## C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
3. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

## D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
  - a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

## E. USB Charging Devices:

1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
  - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

## 2.5 WALL PLATES

## A. Manufacturers:

1. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com)
2. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com)
3. Lutron Electronics Company, Inc: [www.lutron.com](http://www.lutron.com)
4. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

- B. Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Standard.
  - 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

## 2.6 FLOOR BOX SERVICE FITTINGS

- A. Description: Service fittings compatible with floor boxes provided under Section 26 0533.16 with components, adapters, and trims required for complete installation.
- B. Flush Floor Service Fittings:
  - 1. Dual Service Flush Combination Outlets:
    - a. Cover: Rectangular.
    - b. Configuration:
      - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
      - 2) Voice and Data Jacks: Provided by others.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.3 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switches: 48 inches above finished floor.
    - b. Receptacles: 18 inches above finished floor or 6 inches above counter.
  - 2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  - 3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- N. Identify wiring devices in accordance with Section 26 0553.

3.4 FIELD QUALITY CONTROL

- A. Inspect each wiring device for damage and defects.
- B. Operate each wall switch and wall dimmer with circuit energized to verify proper operation.
- C. Test each receptacle to verify operation and proper polarity.
- D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- E. Correct wiring deficiencies and replace damaged or defective wiring devices.

END OF SECTION



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## SECTION 26 2816.16 - ENCLOSED SWITCHES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Enclosed safety switches.

#### 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Section 26 0005 - Basic Electrical Requirements.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- D. Section 26 0529 - Hangers and Supports for Electrical Systems.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

#### 1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. ABB/GE: [www.geindustrial.com](http://www.geindustrial.com)
- B. Eaton Corporation: [www.eaton.com](http://www.eaton.com)
- C. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us)
- D. Siemens Industry, Inc: [www.usa.siemens.com](http://www.usa.siemens.com)

### 2.2 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  1. Altitude: Less than 6,600 feet.
  2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
  1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - a. Indoor Clean, Dry Locations: Type 1.
  - b. Outdoor Locations: Type 3R.
- L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- M. Heavy Duty Switches:
  1. Comply with NEMA KS 1.
  2. Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
    - a. Provide means for locking handle in the ON position where indicated.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Identify enclosed switches in accordance with Section 26 0553.

#### 3.2 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

END OF SECTION

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## SECTION 26 5100 - INTERIOR LIGHTING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Interior luminaires.
- B. Ballasts and drivers.
- C. LED emergency power supply units.
- D. Accessories.

#### 1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, repairs.
- C. Section 26 0005 - Basic Electrical Requirements.
- D. Section 26 0533.13 - Conduit for Electrical Systems.
- E. Section 26 0529 - Hangers and Supports for Electrical Systems.
- F. Section 26 0533.16 - Boxes for Electrical Systems.
- G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 26 0935 - Distributed Digital Lighting Control System: Devices for automatic control of lighting, including occupancy sensors, daylighting controls, networked control stations and motion sensors.
- I. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

#### 1.3 REFERENCE STANDARDS

- A. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code) 2013 (Corrigendum 2019).
- B. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).
- C. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information 2002 (Reaffirmed 2008).
- D. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products 2008.
- E. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules 2015, with Errata (2017).

- F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- G. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems 2006.
- H. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.
- I. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices 2020.
- J. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility 2012.
- K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. UL 924 - Emergency Lighting and Power Equipment Current Edition, Including All Revisions.
- N. UL 1598 - Luminaires Current Edition, Including All Revisions.
- O. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

#### 1.5 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  1. LED Luminaires:

- a. Include estimated useful life, calculated based on IES LM-80 test data.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

## 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70 and NFPA 101.

## PART 2 PRODUCTS

### 2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

### 2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70 and NFPA 101.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s), light engines, drivers and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
  - 1. Ceiling Compatibility: Comply with NEMA LE 4.
  - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
- H. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

### 2.3 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:



1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
  3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
- B. Dimmable LED Drivers:
1. Dimming Range: Continuous dimming from 100 percent to 10 percent relative light output unless dimming capability to lower level is indicated, without flicker.
  2. Control Compatibility: Fully compatible with the dimming controls to be installed.
- C. Dimmable LED Drivers: Comply with Section 26 0935 - Distributed Digital Lighting Control System.

## 2.4 LED EMERGENCY POWER SUPPLY UNITS

- A. Manufacturers:
1. Iota Engineering, LLC: [www.iotaengineering.com/#sle](http://www.iotaengineering.com/#sle).
  2. Lithonia Lighting: [www.lithonia.com/#sle](http://www.lithonia.com/#sle).
  3. Philips Emergency Lighting/Bodine: [www.bodine.com/#sle](http://www.bodine.com/#sle).
  4. Manufacturer Limitations: Where possible, for each type of luminaire provide fluorescent emergency power supply units produced by a single manufacturer.
  5. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. Description: Self-contained LED emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- C. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the fluorescent emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- D. Battery: Sealed maintenance-free high-temperature nickel cadmium unless otherwise indicated.
- E. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.
- F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status and field selectable audible alert.

## 2.5 MICRO AND MINI INVERTERS

- A. Manufacturers:
  - 1. Philips Emergency Lighting Bodine: [www.philips.com/bodine](http://www.philips.com/bodine)
  - 2. Iota Engineering: [www.iotaengineering.com](http://www.iotaengineering.com)
  - 3. Engineer pre-approved equal.
- B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- C. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- D. Battery:
  - 1. Hightemperature rechargeable, replaceable nickel-cadmium.
  - 2. Battery shall be sized to supply all connected lamps where indicated.
- E. Diagnostics: Unit shall include test switch and charge indicator light.
- F. Unit shall be sine wave output capable with dual voltage input and output capabilities.
- G. Provide with low-voltage battery disconnect.
- H. Installation locations shall be coordinated with selected manufacturer's requirements and said manufacturer's distance limitations.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- B. Verify that suitable support frames are installed where required.
- C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.

- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Suspended Ceiling Mounted Luminaires:
  - 1. Do not use ceiling tiles to bear weight of luminaires.
  - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
  - 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
  - 4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  - 5. See appropriate Division 09 section where suspended grid ceiling is specified for additional requirements.
- G. Recessed Luminaires:
  - 1. Install trims tight to mounting surface with no visible light leakage.
  - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
  - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Suspended Luminaires:
  - 1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
  - 2. Install canopies tight to mounting surface.
- I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
- J. Install accessories furnished with each luminaire.
- K. Bond products and metal accessories to branch circuit equipment grounding conductor.
- L. Exit Signs:
  - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- M. LED Emergency Power Supply Units:

1. For field-installed units, install inside luminaire unless otherwise indicated. Where installation inside luminaire is not possible, install on top of luminaire.

N. Identify luminaires connected to emergency power system in accordance with Section 26 0553.

O. Install lamps in each luminaire.

### 3.3 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test emergency lighting units to verify proper operation upon loss of normal power supply.

END OF SECTION

SECTION 28 4600 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Circuits from protected premises to supervising station, including conduit.
- C. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.
- D. Maintenance of fire alarm system under contract for specified warranty period.

1.2 RELATED REQUIREMENTS

- A. Division 01 - General Requirements: Project administrative and procedural requirements.
- B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.
- C. Division 07 - Thermal and Moisture Protection: Materials and methods for work to be performed by this installer.
- D. Division 08 - Openings: Door hardware, coiling fire doors and smoke and/or fire curtains to be released by fire alarm system.
- E. Section 21 1300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- F. Section 23 3300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.
- G. Section 26 0005 - Basic Electrical Requirements.
- H. Section 26 0505 - Selective Demolition for Electrical
- I. Section 26 0533.13 - Conduit for Electrical Systems.
- J. Section 26 0533.16 - Boxes for Electrical Systems.
- K. Section 26 0553 - Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.
- C. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

- D. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems Current Edition, Including All Revisions.

#### 1.4 SUBMITTALS

- A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.
- B. Evidence of designer qualifications.
- C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
  - 1. Copy (if any) of list of data required by authority having jurisdiction.
  - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
  - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
  - 4. System zone boundaries and interfaces to fire safety systems.
  - 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
  - 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
  - 7. List of all devices on each signaling line circuit, with spare capacity indicated.
  - 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
  - 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
  - 10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
  - 11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
  - 12. Certification by Contractor that the system design complies with Contract Documents.
- D. Evidence of installer qualifications.
- E. Evidence of instructor qualifications; training lesson plan outline.
- F. Evidence of maintenance contractor qualifications, if different from installer.
- G. Inspection and Test Reports:
  - 1. Submit inspection and test plan prior to closeout demonstration.

2. Submit documentation of satisfactory inspections and tests.
  3. Submit NFPA 72 "Inspection and Test Form," filled out.
- H. Operating and Maintenance Data: Revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
  2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
  3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
  4. List of recommended spare parts, tools, and instruments for testing.
  5. Replacement parts list with current prices, and source of supply.
  6. Detailed troubleshooting guide and large scale input/output matrix.
  7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
  8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- I. Project Record Documents: Have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
  2. "As installed" wiring and schematic diagrams, with final terminal identifications.
  3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- J. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
  2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

## 1.5 QUALITY ASSURANCE

- A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

- B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
  - 1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
  - 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
  - 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
- C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Initiating Devices and Notification Appliances:
  - 1. Same manufacturer as control units.
  - 2. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

### 2.2 FIRE ALARM SYSTEM

### 2.3 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
  - 1. Sprinkler water control valves.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
  - 1. Sprinkler water flow.
- C. Lighting Control
  - 1. Connection between fire alarm systems and lighting control systems.
    - a. Upon activation of fire alarm system, lighting control system shall provide full illumination to all emergency fixtures along path of egress for 90 minutes, or until alarm is reset.
- D. HVAC:
  - 1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

### 2.4 COMPONENTS



- A. General:
  - 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
  - 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Remote Annunciators: locate per plans.
- C. Initiating Devices:
- D. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.
- E. Locks and Keys: Deliver keys to Owner.
- F. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
  - 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
  - 2. Provide one for each control unit where operations are to be performed.
  - 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
  - 4. Provide extra copy with operation and maintenance data submittal.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

#### 3.2 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.

- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

### 3.3 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated Owner personnel:
  - 1. Hands-On Instruction: On-site, using operational system.
  - 2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
- B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
  - 1. Initial Training: 1 session pre-closeout.
- C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
  - 1. Initial Training: 1 session pre-closeout.
- D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

### 3.4 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
  - 1. Be prepared to conduct any of the required tests.
  - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
  - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
  - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
  - 5. Repeat demonstration until successful.

### 3.5 MAINTENANCE

- A. See Division 01 for additional requirements relating to maintenance service.
- B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
  - 1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.

2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
  3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- C. Provide trouble call-back service upon notification by Owner:
1. Provide on-site response within 2 hours of notification.
  2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
  3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- D. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- E. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.
- F. Comply with Owner's requirements for access to facility and security.

END OF SECTION