PROJECT MANUAL Project No. 21.110

for:

# Washington Trust Bank 3rd St. Marketplace TI

1203 NE 3rd St. Bend, OR

**Bidding/Construction** 

July 9, 2020





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## WASHINGTON TRUST BANK

**3RD ST. MARKETPLACE TI** 

Wolfe Architectural Group

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General Conditions for the Work will be AIA Document A201, "General Conditions of the Contract for Construction", 2017 edition with modifications, as attached.

#### END OF DOCUMENT 00 22 00

# **AIA** Document A201° – 2017

## General Conditions of the Contract for Construction

#### for the following PROJECT:

(Name and location or address)

3rd St. Marketplace TI 1203 NE 3rd Street Bend, OR

THE OWNER:

(Name, legal status and address)

Washington Trust Bank PO Box 2127 Spokane, WA 99210-2127

THE ARCHITECT: (Name, legal status and address)

Wolfe Architectural Group 1015 N. Calispel, Suite B Spokane, WA 99201

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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<sup>™</sup>, 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<sup>™</sup>–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<sup>TM</sup>–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

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G202<sup>TM</sup>–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, and a legal description of the site.

**§ 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** The Owner shall furnish to the Contractor five hard copies and one electronic 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 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 may file a Claim pursuant to Article 15.

## ARTICLE 3 CONTRACTOR

#### § 3.1 General

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**§ 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

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§ 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 after the Contract has been executed with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive. By making requests for substitutions, the Contractor:

- .1 Represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.
- .2 Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified.
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- .3 Certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent.
- .4 Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

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

#### § 3.5 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

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The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted when bids are reviewed.

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

**§ 3.7.1** The Owner shall pay for the building permit directly, or as a direct Contractor reimbursable. The Contractor shall secure and pay for all 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

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§ 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.

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#### § 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

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§ 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. Any corrections or modifications of Shop Drawings made by Architect shall be deemed acceptable by Contractor with no adjustment to Contract Sum unless written notice is received by Architect prior to performance of any work of those shop drawings.

**§ 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

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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

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- .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

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**§ 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 operation shall not be responsible for discrepancies or defects in the 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.

#### CHANGES IN THE WORK ARTICLE 7

#### § 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.

§ 7.1.4 The allowance for the combined overhead and profit included in the total cost of changes in the Work to the Owner shall be based on the following schedule:

- .1 For the Contractor, for the Work performed by the Contractor's own forces, 15% of the cost which totals \$3,000 or less, and 10% of the cost which totals more than \$3,000.
- .2 For the contractor, for the Work performed by the Contractor's Subcontractor, 10% of the amount due the Subcontractor.
- .3 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's or Sub-subcontractor's own forces, 15% of the cost.
- .4 For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, 5% of the amount due the Sub-subcontractor.
- .5 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials, and subcontracts. Labor and material shall be itemized in the manner prescribed above. Where major cost items are Subcontractors, they shall be itemized also.

## § 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.

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§ 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.

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#### § 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.

§ 8.2.4 Substantial Completion for this project is 120 Calendar Days from the Commencement Date as established by the written Notice to Proceed. It shall be the responsibility of the General Contractor to coordinate and schedule all work in order to achieve this requirement.

#### § 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.

§ 9.3.1.3 Until Substantial Completion, the Owner shall pay 95 percent of the amount due the Contractor on account of progress payments.

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

§ 9.3.3 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.

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§ 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.

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§ 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.

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§ 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

- liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled; .1
- .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.

#### § 9.11 Liquidated Damages

§ 9.11.1 The Contractor and the Contractor's surety, shall be liable and shall pay the Owner the sums hereinafter stipulated as liquidated damages as follows. This will be strictly enforced per the requirements of Substantial Completion as described herein:

.1 For each calendar day of delay until the Work is substantially complete: Two-Hundred Fifty Dollars (\$250.00).

## 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

- employees on the Work and other persons who may be affected thereby; .1
- .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

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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.

#### **INSURANCE AND BONDS** ARTICLE 11

# § 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.

§ 11.1.1 Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:

- Premise Operations including X, C, and U coverage as applicable. .1
- .2 Independent Contractor's Protective.
- .3 Products and Completed Operations.
- .4 Personal Injury Liability with Employment Exclusion deleted.
- .5 Contractual, including specified provision for Contractor's obligation under Paragraph 3.18.
- .6 Owned, non-owned and hired motor vehicles.
- .7 Broad Form Property Damage including Completed Operations.

§ 11.1.1.2 If the General Liability coverages are provided by a Commercial General Liability Policy on a claims-made basis, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2.

§ 11.1.1.3 The insurance required by Subparagraph 11.1.1.1 shall be written for not less than the following limits, or greater if required by law:

- .1 Workers' Compensation:
  - State: Statutory Limit .1
  - .2 Employer's Liability: \$1,000,000 per accident
- .2 Comprehensive or Commercial General Liability:
  - .1 Bodily Injury: \$1,000,000 each occurrence; \$2,000,000 aggregate
  - .2 Property Damage: \$1,000,000 each occurrence; \$2,000,000 aggregate
  - .3 Products and Completed Operations Insurance shall be maintained for three years after final payment: \$1,000,000 aggregate
  - .4 Property Damage Liability Insurance shall provide X, C, and U coverage.
  - .5 Broad Form Property Damage coverage shall include Completed Operations.
- .3 Contractual Liability:
  - Bodily Injury: \$1,000,000 each occurrence; \$1,000,000 aggregate. .1
  - .2 Property Damage: \$1,000,000 each occurrence; \$1,000,000 aggregate.

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.4 Personal Injury, with Employment Exclusion deleted:

.1 \$1,000,000 aggregate.

.5 Business Auto Liability (owned, non-owned, hired):

- Bodily Injury: \$1,000,000 each person; \$1,000,000 each accident. .1
- .2 Property Damage: \$1,000,000 each occurrence.
- .6 If the General Liability coverage is provided by a Commercial Liability policy, the
  - General Aggregate shall be not less than \$2,000,000, and it shall pertain to this Project only; .1
  - .2 Fire Damage Limit shall be not less than \$300,000 on any one fire;
  - .3 Medical Expense Limit shall be not less than \$10,000 on any one person.
- .7 Umbrella Excess Liability: \$1,000,000 over primary insurance.

§ 11.1.2 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.

# (Paragraphs deleted)

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# § 11.2 Owner's Insurance

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

§ 11.2.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.2.1.2 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

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

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

§ 11.2.2 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.

§ 11.2.4 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.2.5 The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

# § 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.

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# §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.

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§ 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.

#### TERMINATION OR SUSPENSION OF THE CONTRACT **ARTICLE 14**

# § 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 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
- The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2. .4

§ 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

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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

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§ 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

- damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, .1 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.

Init. 1

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§ 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.

Init. 1

# § 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.

# DOCUMENT 00 22 50 - FORM OF AGREEMENT

Agreement for Work will be written on AIA Document A101 Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, 2017 edition, as attached.

END OF DOCUMENT 00 22 50

# **AIA** Document A101° – 2017

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

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

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

Washington Trust Bank PO Box 2127 Spokane, WA 99210-2127

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

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

3rd St. Market Place TI 1203 NE 3rd Street Bend, OR

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

Wolfe Architectural Group 1015 N. Calispel, Suite B Spokane, WA 99201

The Owner and Contractor agree as follows.

#### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

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# EXHIBIT A INSURANCE AND BONDS

#### **ARTICLE 1** THE CONTRACT DOCUMENTS

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

#### **ARTICLE 2** THE WORK OF THIS CONTRACT

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

#### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

- [ ] The date of this Agreement.
- [X] A date set forth in a notice to proceed issued by the Owner.
- [ ] Established as follows:

(Insert a date or a means to determine the date of commencement of the Work.)

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

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

# § 3.3 Substantial Completion

Init.

1

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

- [**X**] Not later than One-Hundred Twenty (120) calendar days from the date of commencement of the Work.
- By the following date: []

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

Portion of Work	Substantial Completion Date
-----------------	-----------------------------

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

#### ARTICLE 4 CONTRACT SUM

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

# § 4.2 Alternates

Item

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

<b>§ 4.2.2</b> Subject to the condition execution of this Agreement. <i>(Insert below each alternate a</i> )	ons noted below, the following alternates may be Upon acceptance, the Owner shall issue a Modif and the conditions that must be met for the Owner	accepted by the Owner following ication to this Agreement. <i>r to accept the alternate.</i> )
Item	Price	Conditions for Acceptance

Price

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

Item

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

Price

Item	Units and Limitations	Price per Unit (\$0.00)
AET:		

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

Two Hundred Fifty Dollars and Zero Cents (\$250.00) for each consecutive calendar day that the Contractor is in default after the time to achieve Substantial Completion, specified herein.

# § 4.6 Other:

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

Init. 1

#### ARTICLE 5 PAYMENTS

# § 5.1 Progress Payments

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

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

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the last day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the fifteenth day of the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than thirty (30) days after the Architect receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)

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

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

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

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

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

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

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201-2017;
- Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, .3 unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

# § 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

# Five Percent (5.0%)

Init. 1

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§ 5.1.7.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

## § 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

None

§ 5.1.7.3 Upon Final Completion of the Work, the Contractor shall submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. (Paragraphs deleted)

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

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

# § 5.2 Final Payment

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

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

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

# § 5.3 Interest

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

5.0 % Five percent per annum

## ARTICLE 6 DISPUTE RESOLUTION § 6.1 Initial Decision Maker

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

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# § 6.2 Binding Dispute Resolution

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

- [X] Arbitration pursuant to Section 15.4 of AIA Document A201-2017
- [ ] Litigation in a court of competent jurisdiction
- [] Other (Specify)

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

# ARTICLE 7 TERMINATION OR SUSPENSION

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

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

The Contractor shall be entitled to receive payment for work properly executed, and costs incurred by reason of such termination.

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

#### **MISCELLANEOUS PROVISIONS ARTICLE 8**

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

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

Keith Erhart Washington Trust Bank PO Box 2127 Spokane, WA 99210-2127

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

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

#### § 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in Article 11 of the General Conditions.

(Paragraphs deleted)

ARTICLE 9 **ENUMERATION OF CONTRACT DOCUMENTS** 

§ 9.1 This Agreement is comprised of the following documents:

- AIA Document A101<sup>TM</sup>–2017, Standard Form of Agreement Between Owner and Contractor .1
- AIA Document A201<sup>™</sup>–2017, General Conditions of the Contract for Construction .2
- .3 Drawings: See Exhibit A (attached).
- .4 Specifications: See Exhibit B (attached).

.5

#### (Paragraphs deleted) Addenda, if any:

Number

Date

Pages

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

#### (Paragraphs deleted)

.6 Other documents, if any, listed below:

> (List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201<sup>TM</sup>\_2017 provides that the advertisement or invitation to bid. Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

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

**OWNER** (Signature)

**CONTRACTOR** (Signature)

Keith Erhart, Vice President, Facilities Manager (Printed name and title)

(Printed name and title)

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SECTION 01 10 00 - SUMMARY

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Work under separate contracts.
  - 4. Access to site.
  - 5. Work restrictions.
  - 6. Specification and drawing conventions.

#### 1.2 PROJECT INFORMATION

- A. Project Identification: Washington Trust Bank, 3rd St. Marketplace TI.
  - 1. Project Location: 1203 NE 3rd Street, Bend, OR.
- B. Architect: Wolfe Architectural Group.
  - 1. Contact: Bali Mshar, Phone: 509-455-6999.
- C. Owner: Washington Trust Bank
  - 1. Contact: Keith Erhart, Phone: 509-353-4204

# 1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
  - 1. Tenant improvement of an existing 4,575 sf single story shell space for a Branch Banking Facility. The Work consists of a complete banking facility. Work includes minor structural work, mechanical and electrical systems, and coordination of Owner supplied work.

#### 1.4 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
  - 1. Data and Telephone System
  - 2. Security System
  - 3. Fixture, Furniture, and Equipment
  - 4. ATM
  - 5. Night Drop

# 1.5 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

## 1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Controlled Substances: Use of tobacco products and other controlled substances within the building during construction is not permitted.

## 1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

# PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

# SECTION 01 25 00 - SUBSTITUTION PROCEDURES

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

## 1.2 DEFINITIONS

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

## 1.3 ACTION SUBMITTALS

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

- j. Detailed comparison of Contractor's construction schedule using proposed 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 date of receipt of purchase order, lack of availability, or delays in delivery.
- k. Cost information, including a proposal of change, if any, in the Contract Sum.
- I. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
- m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
  - a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

## 1.4 QUALITY ASSURANCE

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

# PART 2 - PRODUCTS

## 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
    - c. Requested substitution will not adversely affect Contractor's construction schedule.
    - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - e. Requested substitution is compatible with other portions of the Work.
    - f. Requested substitution has been coordinated with other portions of the Work.
    - g. Requested substitution provides specified warranty.

- h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed.

# PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00



# SUBSTITUTION REQUEST (During the Bidding Phase)

Project:	t: Washington Trust Bank		Substitution	Substitution Request Number:		
	3rd St. Marketplace TI		From:			
To:			Date:			
		A/E Projec	A/E Project Number:			
Re:	x		Contract Fo	Contract For:		
Specifica	tion Sectio <u>n:</u>		Description	::		
Section N	Number:	_ Page:	Article/Par	Article/Paragraph:		
Proposed	Substitution:					
Manufac	turer:	Address:		Phone:		
Trade Na	ime:			Model No.:		

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

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.
- 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.

Submitted by: Signed by:	
Firm: Address:	
Telephone:	
receptione.	

# A/E's REVIEW AND ACTION

<ul> <li>Substitution approved - M</li> <li>Substitution approved as</li> <li>Substitution rejected - Us</li> <li>Substitution Request record</li> </ul>	Make submittals in noted - Make subr se specified materia eived too late - Use	accordance with Spe nittals in accordance als. e specified materials.	cification Section with Specification	013300. n Section 013300.		
Signed by:					Date:	
Supporting Data Attached:	Drawings	Product Data	Samples	Tests	Reports	_
© Copyright 1996, Constructior 99 Canal Center Plaza, Suite 30	n Specifications Instit 0 Alexandria, VA 22	ute, 314	Page of		September 199 CSI Form 1.5	€ €

# SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

## PART 1 - GENERAL

#### 1.1 SUMMARY

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

## 1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

#### 1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within 5 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.
    - 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 a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications see AIA Document A201 General Conditions of the Contract for Construction included herewith.
  - 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 a statement indicating the effect the proposed change in the Work will have on the Contract Time.
  - 6. Comply with requirements in Division 1 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

# 1.4 CHANGE ORDER PROCEDURES

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

#### 1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

# SECTION 01 29 00 - PAYMENT PROCEDURES

## PART 1 - GENERAL

#### 1.1 SUMMARY

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

# 1.2 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. Submittal schedule.
  - 2. Submit the schedule of values to Architect at earliest possible date but no later than thirty days before the date scheduled for submittal of initial Applications for 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 beginning with Division 2.
  - 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 schedule of values consistent with format of AIA Document G703.
  - 3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  - 4. Include separate line item values for construction progress schedule and updates, mobilization, permits/bonds/insurances, temporary facilities, supervision, survey and layout, demobilization, commissioning and equipment/systems start-up, and project closeout retainage.
    - a. General Conditions and Mobilization shall not exceed 3% of the Contract amount.
    - b. Demobilization shall be not less than 1% of the Contract amount.
    - Project closeout retainage value, for duration between Substantial Completion and Final Acceptance, shall be not less than 1% of the Contract amount. Of that amount, 0.5% shall be for "Punchlist Work". This amount will not be released until Final Completion is reached.
  - 5. No line item of the Schedule of Values shall be greater than \$50,000.

- 6. Break down items of work that include both labor and material into those respective components.
  - a. Further break down HVAC, Plumbing, and Electrical items into "Rough-in" and "Trim" with separate labor and material components listed.
- 7. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
- 8. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 9. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual workin-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
- 11. 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.

# 1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect 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.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 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 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. All copies shall include waivers of lien and similar attachments if required.

- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
  - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit conditional final or full waivers.
  - 3. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. 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. List of suppliers and fabricators.
  - 3. Schedule of values.
  - 4. Contractor's construction schedule.
  - 5. Submittal schedule (preliminary if not final).
  - 6. Performance and Payment Bonds.
  - 7. Certificates of insurance and insurance policies.
- H. Final Payment Application: After Final Acceptance has been issued by the Architect, submit an Application for Payment showing 100 percent completion for the work. Submit with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  - 1. Certificate of Occupancy Permit.
  - 2. A copy of the Test/Adjust/Balance Report per Project Closeout requirements.
  - 3. Record a maintenance and system training completion per Project Closeout requirements.
  - 4. Changeover information related to Owner's occupancy complete.
  - 5. Final cleaning complete.
  - 6. Change of doors locks to Owner.
  - 7. Evidence of completion of Project Closeout requirements.
  - 8. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations have been paid.
  - 9. Delivery of Final Record Drawings & specifications to Architect for review.
  - 10. Delivery of Warranties and Maintenance Agreements via O &M Manuals to Architect for final review.
  - 11. Delivery of Operations & Maintenance Manuals to Architect for review.
  - 12. Updated final statement, accounting for final changes to the Contract Sum.
  - 13. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
  - 14. AIA Document G707-1994, "Consent of Surety to Final Payment."
  - 15. Final meter readings for utilities and a measured record of stored fuel.
  - 16. Cost Segregation Report. Owner provided form to be complete at time of Final Payment Application.

# PART 2 - PRODUCTS (Not Used)

# PART 3 - EXECUTION (Not Used)

# END OF SECTION 01 29 00

# SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Informational Submittals.
  - 2. Requests for Information (RFIs).
  - 3. Project meetings.
- B. Related Requirements:
  - 1. Division 01 Section "Execution" for procedures for coordinating general installation and fieldengineering services, including establishment of benchmarks and control points.

#### 1.2 DEFINITIONS

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

#### 1.3 INFORMATIONAL SUBMITTALS

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

#### 1.4 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  - 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
  - 2. Coordinate and submit RFIs 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 information or interpretation and the following:
  - 1. Project name.

- 2. Project number.
- 3. Date.
- 4. Name of Contractor.
- 5. Name of Architect.
- 6. RFI number, numbered sequentially.
- 7. RFI subject.
- 8. Specification Section number and title and related paragraphs, as appropriate.
- 9. Drawing number and detail references, as appropriate.
- 10. Field dimensions and conditions, as appropriate.
- 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
- 12. Contractor's signature.
- 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: General Contractor's standard form.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
  - 1. The following RFIs 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 RFIs or inaccurately prepared RFIs.
  - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
  - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to 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 in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
  - 1. Project name.
  - 2. Name and address of Contractor.
  - 3. Name and address of Architect.
  - 4. RFI number including RFIs that were dropped and not submitted.
  - 5. RFI description.
  - 6. Date the RFI was submitted.
  - 7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

#### 1.5 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: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
  - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Discuss items of significance that could affect progress, including but not limited to the following:
    - a. Tentative construction schedule.
    - b. Critical work sequencing and long-lead items.
    - c. Designation of key personnel and their duties.
    - d. Procedures for processing field decisions and Change Orders.
    - e. Procedures for RFIs.
    - f. Procedures for testing and inspecting.
    - g. Procedures for processing Applications for Payment.
    - h. Distribution of the Contract Documents.
    - i. Submittal procedures.
    - j. Preparation of record documents.
    - k. Use of the premises.
    - I. Working hours.
    - m. Owner's occupancy requirements.
    - n. Responsibility for temporary facilities and controls.
    - o. Procedures for disruptions and shutdowns.
    - p. Parking availability.
    - q. Office, work, and storage areas.
    - r. Equipment deliveries and priorities.
    - s. First aid.
    - t. Security.
    - u. Progress cleaning.
  - 3. Minutes: Entity responsible for conducting the meeting will record and distribute the 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 of scheduled meeting dates.

- 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including but not limited to, requirements for the following:
  - a. Contract Documents.
  - b. Options.
  - c. Related RFIs.
  - d. Related Change Orders.
  - e. Purchases.
  - f. Deliveries.
  - g. Submittals.
  - h. Possible conflicts.
  - i. Compatibility problems.
  - j. Time schedules.
  - k. Weather limitations.
  - I. Manufacturer's written recommendations.
  - m. Warranty requirements.
  - n. Compatibility of materials.
  - o. Acceptability of substrates.
  - p. Temporary facilities and controls.
  - q. Space and access limitations.
  - r. Regulations of authorities having jurisdiction.
  - s. Testing and inspecting requirements.
  - t. Installation procedures.
  - u. Coordination with other work.
  - v. Required performance results.
  - 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 other parties requiring information.
- 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at biweekly (every two weeks) intervals.
  - 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for work to be completed by the next progress meeting.

- b. Review present and future needs of each entity present, including, but not limited to, the following:
  - 1) Construction issues that have arisen since last progress meeting, including observations, problems, conflicts, or other items that will affect the work.
  - 2) Status of Submittals.
  - 3) Status of RFIs
  - 4) Status of Pending Changes (Proposal Requests)
  - 5) Claims and Disputes.
  - 6) Payment Request.
  - 7) Other Miscellaneous Business.
- 2. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes within 24 hours of such meeting to each party present and to parties requiring information within three days of the meeting.
  - 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. Warranty Meetings: Attend warranty inspection meeting with Subcontractors, Suppliers, or other entities as circumstances require to determine if any corrective action under warranty provisions is needed. Owner will schedule a meeting approximately 30 days prior to the first anniversary of Substantial Completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

# SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Contractor's construction schedule.
  - 2. Daily construction reports.
  - 3. Field condition reports.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
  - 1. PDF electronic file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- C. Daily Construction Reports: Submit at monthly intervals to Architect.
- D. Field Condition Reports: Submit at time of discovery of differing conditions.

#### 1.3 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

# PART 2 - PRODUCTS

#### 2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final completion.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early or late completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
- 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
- 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
- 3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
- 4. Startup and Testing Time: Include not less than 15 days for startup and testing.
- 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion.
- 6. Punch List and Final Completion: Include not more than 21 days for punch list and Final Completion, and allow time for Architect's administrative procedures.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  - 1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Punch List, and Final Completion.

### 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within 7 days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
  - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

# 2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
  - 1. List of subcontractors at Project site.
  - 2. List of separate contractors at Project site.
  - 3. Approximate count of personnel at Project site.
  - 4. Equipment at Project site.
  - 5. Material deliveries.
  - 6. High and low temperatures and general weather conditions, including presence of rain or snow.
  - 7. Accidents.
  - 8. Meetings and significant decisions.
  - 9. Unusual events.
  - 10. Stoppages, delays, shortages, and losses.
  - 11. Emergency procedures.
  - 12. Orders and requests of authorities having jurisdiction.
  - 13. Change Orders received and implemented.

- 14. Construction Change Directives received and implemented.
- 15. Services connected and disconnected.
- 16. Equipment or system tests and startups.
- 17. Partial completions and occupancies.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

### PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one day before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

# SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Construction Photographs

### 1.2 SUBMITTALS

- A. Construction Photographs: Submit one digital image of each photographic view within seven days of taking photographs.
  - 1. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken.

### 1.3 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

# PART 2 - PRODUCTS

# 2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in uncompressed TIFF or JPEG format, produced by a digital camera with minimum sensor size of 8.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

# PART 3 - EXECUTION

### 3.1 PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in file name for each image.
  - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect and Construction Manager.

C. Construction Photographs: Take a minimum of 10 digital photographs weekly to document progress of construction. Select vantage points to show status of construction and progress since last photographs were taken. Email to Architect and Owner weekly.

END OF SECTION 01 32 33

# SECTION 01 33 00 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
  - 1. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 2. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 3. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

#### 1.3 ACTION SUBMITTALS

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

### 1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Architect upon request for Contractor's use in preparing submittals.
  - 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
  - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  - 2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
  - 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
  - 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Contractor.
    - e. Name of firm or entity that prepared submittal.
    - f. Names of subcontractor, manufacturer, and supplier.
    - g. Category and type of submittal.
    - h. Submittal purpose and description.
    - i. Specification Section number and title.
    - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    - k. Drawing number and detail references, as appropriate.
    - I. Location(s) where product is to be installed, as appropriate.
    - m. Related physical samples submitted directly.
    - n. Indication of full or partial submittal.
    - o. Transmittal number, numbered consecutively.

- p. Submittal and transmittal distribution record.
- q. Other necessary identification.
- r. Remarks.
- 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
  - a. Project name.
  - b. Number and title of appropriate Specification Section.
  - c. Manufacturer name.
  - d. Product name.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations: Identify deviations from the Contract Documents on submittals.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  - 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. 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.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

# PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements:
  - 1. Submit electronic submittals via email as PDF electronic files.
    - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  - 2. Action and Informational Submittals: Submit one paper copy of each submittal unless otherwise indicated.
  - 3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
    - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

- 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 published 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 catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  - 4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  - 5. Submit Product Data before or concurrent with Samples.
  - 6. Submit Product Data in the following format:
    - a. PDF electronic file.
- 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. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  - 2. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
- 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 applicable Specification Section.
- 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
- 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
- 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
  - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - a. Number of Samples: Submit one (1) set of Samples.
    - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- F. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- G. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- J. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

- K. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- L. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- M. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- N. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- O. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- P. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- Q. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- R. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- S. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- T. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- U. Design Data: Prepare and submit 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.

# 2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and four paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

### PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."
- C. 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 ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it.
  - 1. Submittal Review Form: The Architect will attach to each submittal a self-explanatory action form. The form will be appropriately marked to indicate the action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

# SECTION 01 40 00 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. 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. Specified tests, inspections, and related actions do not limit Contractor's other qualityassurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Requirements:
  - 1. Divisions 02 through 33 Sections for specific test and inspection requirements.

### 1.2 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.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
  - 1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

- 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 specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., 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. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

### 1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: 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 conflicting 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 within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

# 1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
  - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

### 1.5 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, 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. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, and telephone number of representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  - 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  - 5. Other required items indicated in individual Specification Sections.
- C. 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. 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.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections 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. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; 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.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. 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. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - d. When testing is complete, remove test specimens, assemblies; 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, 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.
  - 2. Notify Architect 7 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 approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven 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.

# 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. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, 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 24 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 manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.
- 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 and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the 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 qualitycontrol 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. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. 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.

# 1.8 SPECIAL TESTS AND INSPECTIONS

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

# PART 2 - PRODUCTS (Not Used)

# PART 3 - EXECUTION

# 3.1 TEST AND INSPECTION LOG

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

- 1. Date test or inspection was conducted.
- 2. Description of the Work tested or inspected.
- 3. Date test or inspection results were transmitted to Architect.
- 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and Commissioning Authority's, reference during normal working hours.

### 3.2 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 or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

### END OF SECTION 01 40 00

# SECTION 01 42 00 - REFERENCES

### PART 1 - GENERAL

### 1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": 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.

### 1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

### 1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Agencies, Standards, and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entity, standard, or regulation.

# PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

# SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

### 1.1 SUMMARY

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

# 1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

### 1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

# PART 2 - PRODUCTS

#### 2.1 TEMPORARY FACILITIES

A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

### 2.2 EQUIPMENT

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

- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, selfcontained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.

# PART 3 - EXECUTION

- 3.1 INSTALLATION, GENERAL
  - A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

- 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- H. Telephone Service: Provide temporary telephone service and/or wireless connection in common-use facilities for use by all construction personnel.
- I. Post a list of important telephone numbers.
  - 1. Police and fire departments.
  - 2. Ambulance service.
  - 3. Contractor's home office.
  - 4. Contractor's emergency after-hours telephone number.
  - 5. Architect's office.
  - 6. Engineers' offices.
  - 7. Owner's office.
  - 8. Principal subcontractors' field and home offices.
- J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access project electronic documents and maintain electronic communications.
  - 1. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
  - 2. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall.
  - 3. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- B. Parking: Provide temporary parking areas for construction personnel.
- C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."
- D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- D. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
  - 1. Prohibit smoking in construction areas.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

# 3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
  - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  - 2. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

# 3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

- 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
- 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION 01 50 00

# SECTION 01 60 00 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Division 01 Section "Substitution Procedures" for requests for substitutions.

### 1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, inservice performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

### 1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
    - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."

- b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

### 1.4 QUALITY ASSURANCE

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

### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

### C. Storage:

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

### 1.6 PRODUCT WARRANTIES

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

- 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  - 3. Refer to Divisions 02 through 33. Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

# PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  - 4. Where products are accompanied by the term "as selected," Architect will make selection.
  - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
  - 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - 3. Products:
    - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
    - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

- 4. Manufacturers:
  - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
- 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

### 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
  - 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)

# END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
- B. Related Requirements:
  - 1. Division 01 Section "Summary" for limits on use of Project site.
  - 2. Division 01 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.

### 1.2 INFORMATIONAL SUBMITTALS

A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

### 1.3 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

# PART 2 - PRODUCTS

- 2.1 MATERIALS
  - A. General: Comply with requirements specified in other Sections.

- 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements of Division 01 LEED Requirements Section.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of inplace materials.

# PART 3 - EXECUTION

# 3.1 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

# 3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information (RFI) to Architect according to requirements in Division 01 Section "Project Management and Coordination."

# 3.3 CONSTRUCTION LAYOUT

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

### 3.4 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.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

# 3.5 CUTTING AND PATCHING

A. Cutting and Patching, 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 modification of installed work, installation of additional components, or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. 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.
- D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements on Civil Drawings when required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be relocated or removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.6 PROGRESS CLEANING

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

- 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
- 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
- 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, 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: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- 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 equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

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# 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.

END OF SECTION 01 73 00

# SECTION 01 77 00 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.

### B. Related Requirements:

- 1. Division 01 Section "Photographic Documentation" for submitting final completion construction photographic documentation.
- 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
- 3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
- 4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
- 5. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

### 1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

### 1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.
- 1.4 MAINTENANCE MATERIAL SUBMITTALS
  - A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.
# 1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Procedures Prior to Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases (i.e. Certificate of Occupancy).
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 4. Complete startup and testing of HVAC systems and equipment and provide a copy of the Test/adjust/balance report per Project Closeout requirements.
  - 5. Complete full operational testing of the electrical distribution system as defined in Project Closeout Requirements.
  - 6. Perform preventive maintenance on equipment used prior to Substantial Completion.
  - 7. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
  - 8. Advise Owner of changeover in heat and other utilities.
  - 9. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  - 11. Final meter readings for utilities and a measured record of stored fuel.
  - 12. Complete final cleaning requirements, including touchup painting.
  - 13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
  - 14. Complete Commissioning with all issues issued by the Commissioning Agent corrected.
- C. Inspection: Submit a written request for inspection. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
  - 1. 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.

# 1.6 FINAL COMPLETION PROCEDURES

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
  - 1. Submit a final Application for Payment according to Division 1 Section "Payment procedures".
  - 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by

Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

- 3. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
- 4. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
- 5. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
  - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
- 6. Submit sustainable design submittals required in Division 01 LEED Requirements Section and in individual Division 02 through 33 Sections.
- B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

# 1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  - 1. Organize list of spaces in sequential order.
  - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  - 3. Submit list of incomplete items in the following format:
    - a. PDF electronic file.

# 1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: 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, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

- 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inchpaper.
- 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.
- 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

# PART 3 - EXECUTION

#### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site, 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; clean according to manufacturer's recommendations 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.
- I. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- p. Leave Project clean and ready for occupancy.

## 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
  - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
  - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
  - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
  - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

# SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Operation manuals for systems, subsystems, and equipment.
  - 3. Product maintenance manuals.
  - 4. Systems and equipment maintenance manuals.
- B. Related Requirements:
  - 1. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

## 1.2 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
  - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.
  - 2. One paper copy. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
  - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

# PART 2 - PRODUCTS

## 2.1 REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- C. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
  - 6. Name and contact information for Construction Manager.
  - 7. Name and contact information for Architect.
  - 8. Name and contact information for Commissioning Authority.
  - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  - 10. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
  - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inchpaper; with clear plastic sleeve on

spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

- a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
- 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
- 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
- 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

# 2.2 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  - 2. Performance and design criteria if Contractor is delegated design responsibility.
  - 3. Operating standards.
  - 4. Operating procedures.
  - 5. Operating logs.
  - 6. Wiring diagrams.
  - 7. Control diagrams.
  - 8. Piped system diagrams.
  - 9. Precautions against improper use.
  - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
  - 1. Product name and model number. Use designations for products indicated on Contract Documents.
  - 2. Manufacturer's name.
  - 3. Equipment identification with serial number of each component.
  - 4. Equipment function.
  - 5. Operating characteristics.
  - 6. Limiting conditions.
  - 7. Performance curves.
  - 8. Engineering data and tests.
  - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:

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

#### 2.3 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

## 2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance

and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

# PART 3 - EXECUTION

## 3.1 MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format,

identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

- C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of operation and maintenance manuals.
- D. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

# SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
- B. Related Requirements:
  - 1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 2. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

# 1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set of marked-up record prints.
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints and one set of file prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit one paper-copy set(s) of marked-up record prints.
      - 2) Submit record digital data files and one set(s) of record digital data file plots.
      - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

# PART 2 - PRODUCTS

## 2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Record data as soon as possible after obtaining it.
    - c. Record and check the markup before enclosing concealed installations.
  - 2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  - 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  - 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
  - 1. Format: Annotated PDF electronic file.
  - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  - 3. Refer instances of uncertainty to Architect for resolution.
  - 4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
  - 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  - 2. Format: Annotated PDF electronic file.
  - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  - 4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

# 2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  - 3. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

#### 2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.

#### 2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

# PART 3 - EXECUTION

#### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

# SECTION 01 79 00 - DEMONSTRATION AND TRAINING

## PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training video recordings.

## 1.2 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
  - 1. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

#### 1.3 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

#### 1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

# PART 2 - PRODUCTS

# 2.1 INSTRUCTION PROGRAM

A. Training Modules: Develop a learning objective and teaching outline for each module:

- 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
  - a. System, subsystem, and equipment descriptions.
  - b. Performance and design criteria if Contractor is delegated design responsibility.
  - c. Operating standards.
  - d. Regulatory requirements.
  - e. Equipment function.
  - f. Operating characteristics.
  - g. Limiting conditions.
  - h. Performance curves.
- 2. Documentation: Review the following items in detail:
  - a. Operations manuals.
  - b. Maintenance manuals.
  - c. Project record documents.
  - d. Identification systems.
  - e. Warranties and bonds.
  - f. Maintenance service agreements and similar continuing commitments.
- 3. Emergencies: Include the following, as applicable:
  - a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - I. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.

- b. Test and inspection procedures.
- 7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

# PART 3 - EXECUTION

- 3.1 PREPARATION
  - A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

## 3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

END OF SECTION 01 79 00

## SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
- D. Material test reports and certificates.

#### 1.3 QUALITY ASSURANCE

- A. 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."
- B. Testing Agency Qualifications: An independent agency approved by local authority having jurisdiction and qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- C. Special Inspector Qualifications: Registered with WABO.
- D. Welding Qualifications: Qualify procedures and personnel according to WABO and AWS D1.4/D 1.4M, "Structural Welding Code Reinforcing Steel."
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specifications for Structural Concrete"
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

# PART 2 - PRODUCTS

## 2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- 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.

#### 2.2 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. Supplement with the following:
- B. Normal-Weight Aggregates: ASTM C 33, graded.
  - 1. Maximum Coarse-Aggregate Size: 1 inch nominal maximum.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

#### 2.3 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.

#### 2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. 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, dissipating.

# 2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

#### 2.6 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not more than 20 percent
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
- D. Proportion normal-weight concrete mixtures in accordance with "Table of Mix Design Requirements" listed in the Structural General Notes.

#### 2.7 FABRICATING REINFORCEMENT

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

#### 2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
  - 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.

# 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.

## 3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

# 3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. 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.

## 3.5 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. 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. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

#### 3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
  - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Completely remove fins and other projections.

- 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
- 2. Do not apply rubbed finish to smooth-formed finish.
- 3. Apply smooth-rubbed finish, defined in ACI 301, to smooth-formed finished concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

# 3.7 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces indicated to be exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  - 2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

# 3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and 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. 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.
  - 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.
    - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer
  - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

## 3.9 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.

#### 3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
  - 1. Testing Services: Tests shall be performed according to ACI 301.

#### END OF SECTION 03 30 00

# SECTION 03 35 00 - CONCRETE FINISH SEALERS

#### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes: Clear sealers for use at interior exposed concrete slabs on grade.

#### 1.2 SUBMITTALS

A. Product Data: Submit product data, including chemical properties and percentage of solids, for each product.

#### 1.3 QUALITY ASSURANCE

- A. Applicator's Qualifications: Company specializing in performing work of this Section with 3 years minimum experience.
- 1.4 DELIVERY, STORAGE, AND HANDLING
  - A. Store products above 50 degrees F, but no greater than 85 degrees F, unless otherwise recommended by manufacturer.

#### 1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when ambient or substrate surface temperatures are below 40 degrees F or higher than 100 degrees F.
- B. Do not apply during inclement weather or when forecasted conditions will not permit compliance with manufacturer's printed instructions.
- C. Provide mechanical ventilation during and after application to dissipate fumes if natural ventilation is insufficient.

## 1.6 SCHEDULING

- A. Schedule application of products at proper time intervals after concrete finishing and curing operations.
- B. Maintain proper moisture content of concrete before, during, and after application of specified products.

# 1.7 WARRANTY

- A. Warrant applied sealer system to be free of defects related to material deficiency and workmanship for 5 years.
- B. Warranty period begins at date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Provide materials, equipment, and personnel required to achieve specified finish.
- B. Water Based Acrylic Sealing Compounds:
  - 1. ASTM C1315, Type I, Class A, VOC compliant, free of natural or petroleum waxes. Dries clear with satin sheen.
  - 2. Compatible with subsequent coatings and toppings.
  - 3. Compatible with access flooring pedestal adhesive.
  - 4. Acceptable Products:
    - a. MonoChem AguaSeal W20, Monopole.
    - b. MonoChem PermaSeal, Monopole.
    - c. VOCOMP-25, W. R. Meadows, Inc., Elgin, IL.]
  - 5. Locations: Exposed concrete in Janitor and Electrical Rooms and similar areas scheduled for sealed concrete floors.
  - 6. Verify compatibility with adhesive used in conjunction with raised flooring pedestals.

# PART 3 - EXECUTION

# 3.1 EXAMINATION

- A. Examine conditions and proceed with work when substrates are acceptable.
- B. Verify that damage and defects in concrete surface have been repaired as specified in Section 03 30 00 and accepted by Architect.
- C. Verify that surfaces are clean, dry, dust free, and free of efflorescence, oil or other matter detrimental to sealer application.
- D. Verify that joint sealant work in adjoining surfaces is complete prior to applications of sealers. Delay application until sealants have cured.
- E. Ensure concrete has cured for time period required by manufacturer of product to be applied before application of products.

# 3.2 PREPARATION

- A. Provide protection as necessary to protect adjacent materials and surfaces from dirt, dust, and other surface or physical damage.
- B. Prevent migration of airborne materials by use of tarpaulins, wind breaks, and similar containment devices.
- C. Maintain control of concrete chips, dust and debris. Collect water to prevent damage to adjacent surfaces.
- D. Remove loose particles, foreign matter, and oil by method which will not affect sealer application.
- E. Prepare surfaces in accordance with manufacturer's directions.
- F. Provide protection as necessary to protect adjacent materials and surfaces from dirt, dust, spillage, overspray and other surface or physical damage.

#### 3.3 APPLICATION

- A. Apply materials in accordance with manufacturer's printed instructions.
- B. Liquid Membrane-Forming Sealer and Hardeners:
  - 1. Apply sealer using low pressure airless sprayer in single coat at 400 to 600 ft/gal coverage unless greater amount is recommended by manufacturer to obtain penetration and full coverage.
  - 2. Do not allow flooding or puddling of material on surface.
  - 3. Do not dilute or alter material as packaged.

#### 3.4 FIELD QUALITY CONTROL

A. After penetrating water repellent sealer has dried, spray surfaces with clear water to reveal areas that have not received application. Allow surfaces to dry before applying penetrating water repellent sealer materials in areas exhibiting moisture absorption.

#### 3.5 ADJUSTING

- A. Repair or replace adjacent Work which has been damaged by finishing operations.
- 3.6 CLEANING
  - A. Clean-up and remove debris daily.
  - B. Clean spillage, overspray, or drift from adjacent surfaces; remove immediately in accordance with manufacturer's instructions.

# 3.7 PROTECTION

A. Protect finished concrete surfaces from damage by construction equipment and operations.

END OF SECTION 03 35 00

# SECTION 05 12 00 - STRUCTURAL STEEL

#### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes structural steel and grout.

## 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.

#### 1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- C. Comply with applicable provisions of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

# PART 2 - PRODUCTS

#### 2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M or ASTM A 572/A 572M, Grade 50.
- B. Channels, Angles-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

# 2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Anchor Rods: ASTM F 1554, Grade 36, straight.

- 1. Finish: Plain.
- C. Threaded Rods: ASTM A 36/A 36M.
  - 1. Finish: Plain

#### 2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

#### 2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

#### 2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design or Load and Resistance Factor Design Specification for Structural Steel Buildings."

#### 2.6 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

#### 2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
  - 3. Surfaces to receive sprayed fire-resistive materials.
  - 4. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 2, "Hand Tool Cleaning."
  - 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written 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.

# 2.8 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Comply with testing and inspection requirements of Part 3, Article "Field Quality Control."
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

## PART 3 - EXECUTION

## 3.1 ERECTION

- A. Examination: Verify elevations of concrete- bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. 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 or Load and Resistance Factor Design Specification for Structural Steel Buildings."
- C. Base Plates: Clean concrete- bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base plates. Clean bottom surface of base plates.
  - 1. Set base plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of base plate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and baseplates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.
- D. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

#### 3.2 FIELD CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings–Allowable Stress Design and Plastic Design or Load and Resistance Factor Design Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

# 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds.
- B. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
- C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

# END OF SECTION 05 12 00

# SECTION 06 06 60 - RESIN PANELS

## PART 1 - GENERAL

## 1.1 SUMMARY

A. Section includes plastic sheet paneling.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, panel dimensions, details, and attachments to other work.
- C. Samples: For resin panels.
- D. Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions.

# PART 2 - PRODUCTS

#### 2.1 MANUFACTURER

A. Manufacturer: 3form, LLC., Salt Lake City, Utah, USA / telephone 801-649-2500.

## 2.2 MATERIALS

- A. Resin Panels
  - 1. Refer to finish Schedule in Drawings for specific material, color, and finish.
  - 2. Basis of Design Product: The design of the resin panels is based on Chroma as provided by 3form, Inc. Products from other manufacturers must be approved by the Architect prior to bidding.
- B. Sheet minimum performance attributes:
  - 1. Rate of Burning (ASTM D 635). Material must attain CC2 Rating for a nominal thickness of 1.5 mm (0.060 in.) and greater.
  - 2. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 850°F.
  - 3. Density of Smoke (ASTM D 2843). Material must have a smoke density less than 10%.
  - 4. Coefficient of Friction (ASTM 2047) 0.73 Dry, 0.79 Wet
  - 5. Dynamic environmental testing (ASTM standards D 5116 or D 6670). Panels must not have detectable VOC off-gassing agents.
  - 6. Product must be fused using heat and pressure, not laminated with adhesives.

7. Color must be PVC-Free and be an acrylic resin made with pigments, not dyes. Must be UV stable colors

## 2.3 FABRICATION

- A. General: Fabricate Plastic Fabrications to designs, sizes and thicknesses indicated and to comply with indicated standards.
- B. Comply with manufacturer's written recommendations for fabrication.

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of Plastic Fabrications will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

# 3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for the installation of Plastic Fabrications. Sizes, profiles and other characteristics are indicated on the drawings, additional installation details can be found on the 3form Certified Installer, if applicable.
- B. Manufacturer's shop to fabricate items to the greatest degree possible.
- C. Utilize fasteners, adhesives and bonding agents recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed or discolored as a result of installation or fabrication methods will be rejected.
- D. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
- E. Form field joints using manufacturer's recommended procedures. Locate seams in panels so that they are not directly in line with seams in substrates.

# 3.3 CLEANING AND PROTECTION

A. Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to Architect's satisfaction.

#### END OF SECTION 06 06 60

# SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Wood blocking and nailers.
  - 2. Plywood panels.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
  - 1. Preservative-treated wood.
  - 2. Fire-retardant-treated wood.
  - 3. Power-driven fasteners.

# PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

- A. Provide dimensional lumber and plywood materials that have been harvested as well as manufactured within 500 air miles of the project site.
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Provide dressed lumber, S4S, unless otherwise indicated.
  - 3. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

# 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

- 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. 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, 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 inchesabove the ground in crawl spaces or unexcavated areas.
  - 5. Wood floor plates that are installed over concrete slabs-on-grade.

## 2.3 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.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

# 2.4 PLYWOOD PANELS

A. Plywood Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 23/32-inchnominal thickness.

#### 2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Power-Driven Fasteners: NES NER-272.
- C. Screws for Fastening to Metal Framing: ASTM C 1002; ASTM C 954 for fastening to cold formed metal framing, length as recommended by screw manufacturer for material being fastened.

# PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit.

- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- F. Securely attach 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.

# END OF SECTION 06 10 53
# SECTION 06 16 00 - SHEATHING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Wall sheathing.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

### PART 2 - PRODUCTS

## 2.1 WALL SHEATHING

- A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
  - 1. Type and Thickness: Type X, 5/8 inch thick.

### 2.2 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

## PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

# 3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
  - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
  - 2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
  - 3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Seal sheathing joints according to sheathing manufacturer's written instructions.
  - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
  - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 06 16 00

# SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

# PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes interior woodwork including for the following applications:
  - 1. Plastic-laminate covered cabinets.
  - 2. Exposed wood furring, blocking, shims, and hanging strips required for proper installation of materials and products of this Section.
- B. Related Sections:
  - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, and shims concealed within other construction before woodwork installation.
  - 2. Division 12 Section "Plastic-Laminate-Clad Countertops" for plastic-laminate countertops.
  - 3. Division 12 Section "Quartz Agglomerate Countertops" for quartz countertops.

# 1.2 SUBMITTALS

- A. Product Data: For the following:
  - 1. Cabinet hardware and accessories.
  - 2. Finishing materials and processes.
- B. Shop Drawings: Include location of each item, plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
  - 1. Plastic-laminate-clad panel products, for each type, color, pattern, and surface finish and PVC edge banding for each surface.
  - 2. Thermoset decorative-overlay surfaced panel products, for each type, color, pattern, and surface finish.

### 1.3 QUALITY ASSURANCE

- A. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.
  - 1. Provide AWI certification labels or compliance certificate indicating that woodwork complies with requirements of grades specified.

# 1.4 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 levels planned for building occupants during the remainder of the construction period.

# PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cabinet Wood Products:
  - 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, made with binder containing no added urea formaldehyde.
  - 4. Softwood Plywood: DOC PS 1, Medium Density Overlay, made with binder containing no added urea formaldehyde.
- B. Thermoset Decorative Overlay: Particleboard or medium-density fiberboard with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- C. High-Pressure Decorative Laminate: NEMA LD 3.

### 2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials for a complete installation of architectural woodwork, except for items specified in Division 8 Section "Door Hardware."
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, self-closing.
- D. Wire Pulls:
  - 1. All locations except Conference Room: Epco, AP128-SS, Stainless Steel Arc Pull.
- E. Catches: Magnetic, BHMA A156.9, B03141.
- F. Adjustable Shelf Supports: Richelieu, A70-70 or equal.
- G. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
  - 1. Box Drawer Slides: 75 lbf
  - 2. File Drawer Slides: 150 lbf
- H. File Rails: Metal.

- I. Door and Drawer Locks: National Locks or equal. Key locks alike unless noted otherwise on Drawings or herein, stamped with consecutive numbers beginning with 1. Provide master keys stamped "M".
- J. Keypad Cabinet Locks: SDC Security Door Controls or equal, 295, battery powered, programable with key override.
- K. Cord Drop Grommets: Doug Mockett, EDP, 2-1/2 inch diameter hole; color to match adjacent surface.
- L. USB Power Grommets: Doug Mockett, PCS75/USB 1-3/4 inch diameter hole; color to match adjacent surface.
- M. Power/Data Grommets: Doug Mockett, PCS54, recessed grommet containing (1) Power, (1) HDMI, (1) USB Power, and (1) Phone jack.
- N. Trash Grommets: Doug Mockett, TM1C, 6" x 3" brushed stainless steel.
- 0. Table Legs: Doug Mockett, TI28R-4, 4-inch diameter, satin chrome.
- P. Furniture Legs (Coffee/Kiosk location): Doug Mockett, FL20-26-3-19/32", L-shaped leg, polished chrome.
- Q. Pull Out Trash/Recycle Bin: Hafele or equal, Kessebohmer Double Bottom Mount. Color: frame silver, bin white.
- R. Desk Cable Tray: Cable Organizer, NOP-CT9424, under desk cable tray.
- S. Exposed Hardware Finishes: Complying with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Stainless Steel: BHMA 630.

### 2.3 MISCELLANEOUS MATERIALS

A. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

### 2.4 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

### 2.5 FABRICATION

- A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
  - 1. Interior Woodwork Grade: Custom.
  - 2. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs. Seal edges of openings in countertops with a coat of varnish.
  - 3. Do not locate joints within 2 feet of sink cut-out.
  - 4. Cap exposed edges with laminate, except where indicated otherwise.

- 5. Deliver to site in units sized for ease for handling and to permit passage through building openings.
- 6. Prime with sealer concealed and semi-concealed surfaces. Brush apply only.
- 7. Provide cutouts for plumbing fixtures, hardware, inserts, appliances, electrical work, and other fixtures. Verify locations of cutouts from site dimensions. Seal or prime paint contact surfaces of cutouts.
- 8. Apply laminate finish in full, uninterrupted sheets of maximum practical lengths. Form corners and butt joints with hairline joints.
- 9. Apply edge banding with waterproof hot-weld adhesive.
- B. Plastic-Laminate Cabinets:
  - 1. AWS Type of Cabinet Construction: Type A, Frameless and cabinet and door interface Style 1, Overlay.
  - 2. Laminate Cladding for Exposed Surfaces: High-pressure decorative of grade indicated.
    - a. Horizontal Surfaces Other Than Tops: HGS or HGL.
    - b. Postformed Surfaces: HGP.
    - c. Vertical Surfaces: HGS or VGS.
    - d. Edges:
      - 1) 0.5 mm PVC banding at solid patterns.
      - 2) 1.0 mm PVC banding at wood grain patterns.
      - 3) 3.0 mm PVC banding at high impact locations.
      - 4) Match laminate in color, pattern, and finish.
  - 3. Materials for Semi-exposed Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
    - a. Drawer Sides and Backs: Thermoset decorative overlay.
    - b. Drawer Bottoms: Thermoset decorative overlay.
  - 4. Materials for Concealed Surfaces: Thermoset decorative overlay.
    - a. Cabinet Interiors: 0.5 mm PVC edge banding.
    - b. Shelves: 0.8 mm PVC edge banding; <sup>3</sup>/<sub>4</sub> inch minimum shelf thickness.
  - 5. Colors, Patterns, and Finishes: Refer to Drawings for product selection.
- C. Material Thickness:
  - 1. Panel structural components: Minimum 3/4 inch thick.
  - 2. Back Panels, Drawer Components, and Drawer Bottoms: Minimum 1/2 inch thick.
  - 3. Fixed Shelves, Dividers, Mounting Stretchers: Minimum 3/4 inch thick.
- D. Semi-Exposed Adjustable Shelving:
  - 1. Core: Medium Density Fiberboard: ANSI A208.2, Classification M-3.
  - 2. Laminate Cladding: Thermoset decorative overlay.
  - 3. Thickness:
    - a. Clear Span under 36 inches wide: Minimum 3/4 inch thick.
    - b. Clear Span equal or greater than 36 inches wide: minimum 1 inch thick.

- E. Exposed Adjustable Shelving:
  - 1. Core: Medium Density Fiberboard: ANSI A208.2, Classification M-3.
  - 2. Laminate Cladding: High-Pressure Decorative Laminate Grade: HGS.
  - 3. Thickness: 1 inch thick:
  - 4. Edge Treatment: 3 mm PVC matching adjacent laminate cladding on horizontal surfaces.

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas and examine and complete work as required, including removal of packing and backpriming before installation.
- B. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- C. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches. Shim as required with concealed shims.
- D. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- E. 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 for exposed fastening, countersunk and filled flush with woodwork.
- F. 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.
  - 1. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws or toggle bolts through metal backing or metal framing behind wall finish.

END OF SECTION 06 40 23

# SECTION 07 21 00 - THERMAL INSULATION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Glass-fiber blanket insulation.
  - 2. Interior wall vapor retarders.

# B. Related Sections:

1. Division 9 Section, Gypsum Board, for acoustical sound attenuation blankets.

### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product test reports.
- C. Research/evaluation reports.

# PART 2 - PRODUCTS

# 2.1 MATERIALS

- A. Fiberglass Insulation General Requirements:
  - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
  - 2. Use formaldehyde free materials where available.
  - 3. Maximize use of recycled material with minimum of 20 percent recycled glass cullet.
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
  - 1. High Density/High performance Batts
    - a. 3 1/2" Batt thickness: R-15.
    - b. 5 1/2" Batt thickness: R-21.

- C. Extruded Polystyrene Board Insulation:
  - 1. General:
    - a. Not manufactured using chlorofluorocarbons (CFCs) and maximize use of recycled material.
    - b. Square edges.
    - c. Thermal resistance "R" value: 5 per inch
    - d. Thickness: Two inches.
  - 2. Classification:
    - a. Exterior Wall: ASTM C578, Type IV (25 PSI)
  - 3. Fire Rating: ASTM E84, 1-inch thick test material, flame spread 10 or less, smoke development 200 or less.
  - 4. Acceptable Products:
    - a. Exterior Walls:
      - 1) GreenGuard SB by Pactiv Building Products.
      - 2) Styrofoam Cavity Mate by The Dow Chemical Company.
      - 3) Foamular CW25 by Owens Corning Foamular.

### 2.2 VAPOR RETARDERS

- A. Fire Retardant Polyethylene Vapor Retarder: Fire retardant, reinforced waterproof polyethylene film applied at interior walls over insulation filled cavity.
  - 1. Fire Rating: Class A, ASTM E84; UL Classified UL Test 723.
  - 2. Tensile Strength: 2000 PSI minimum, ASTM D882.
  - 3. Permeance: ASTM E96, Procedure A; 0.10 perms maximum.
  - 4. Acceptable Products: Griffolyn T-55 FR, Reef Industries or approved substitute.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
  - 1. Fire Rating: ASTM E84, flame spread 25 or less and smoke developed of 50 or less.

# 2.3 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
  - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smokedeveloped indexes of 5, per ASTM E84.
  - 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flamespread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

- C. Tape: Self-adhering pressure sensitive, compatible with insulation, recommended by manufacturer of insulation.
  - 1. Fire Rating: ASTM E84, flame spread 25 or less and smoke developed of 50 or less.

# PART 3 - EXECUTION

# 3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsolled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation 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. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

# 3.2 INSTALLATION OF EXTERIOR RIGID WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer.
  - 1. Fit courses of insulation with edges butted tightly in both directions, and with faces flush.
  - 2. Press units firmly against inside substrates.

## 3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- 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. Batt Insulation: Install 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 the cavities, 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 clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 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, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
  - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

# 3.4 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
  - 1. Before installing vapor retarders, 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.
  - 2. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- C. 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 retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

END OF SECTION 07 21 00

# SECTION 07 26 10 - UNDER SLAB VAPOR RETARDERS

# PART 1 - GENERAL

# 1.1 SUMMARY

A. Section Includes: Vapor retarders for use below slabs-on-grade.

# 1.2 DEFINITIONS

A. Perm: 1 grain/h • ft2 • in-Hg.

# 1.3 SUBMITTALS

- A. General: Submit in accordance with Section 01 33 00.
- B. Product Data: Submit for each product, including tape.

# 1.4 SEQUENCING

A. Begin installation only after substrate work is complete and penetrations are securely anchored.

# PART 2 - PRODUCTS

# 2.1 MATERIALS

- A. Vapor Barrier (15 mil):
  - 1. Virgin waterproof polyolefin film; recycled materials not allowed.
  - 2. Comply with ASTM E1745, Class A minimum.
  - 3. Tensile Strength: 60 pound/inch minimum, ASTM E154, Section 9.
  - 4. Permeance: ASTM E96, Procedure A; 0.01 perms maximum.
  - 5. Puncture Resistance: 2260 grams minimum, ASTM D1709, Method B.
  - 6. Acceptable Product:
    - a. Moistop Ultra 15, Fortifiber Corporation, Los Angeles, CA.
    - b. Perminator 15-mil, WR Meadows.
    - c. Stego Wrap 15 mil Class A, Stego Industries, LLC, San Juan Capistrano, CA.
    - d. Vapor Block 15, Raven Industries, Sioux Falls, SD.
  - 7. Location: For use under slabs on-grade.
- B. Joint Tape: Manufacturer's recommended, pressure sensitive type, self adhering, and of perm rating not less than vapor retarder.

C. Pipe Boots: Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

# PART 3 - EXECUTION

# 3.1 EXAMINATION AND PREPARATION

- A. Examination: Examine conditions and proceed with Work in accordance with Section 01400.
  - 1. Verify that substrate work is complete, clean and dry before beginning installation of sheet products.

### 3.2 INSTALLATION

- A. Under Slab-on-Grade:
  - 1. Install vapor retarder in accordance with manufacturer's written instructions, ACI publication 302 "Guide for Concrete Floor and Slab Construction", and ASTM E1643
  - 2. Lay-out sheets to minimize quantity of joints. Lap edge and end joints 12 inches minimum and continuously seal with joint tape. Lay sealant bead or double stick tape between layers that overlap.
  - 3. Seal penetrations, including pipes, with manufacturer's pipe boot. Seal around pipes, plumbing risers, electrical conduit, other slab penetrations.
  - 4. Turn up sheets 12 inches at perimeter; at footers and vertical walls, and against penetrations. Seal joints and terminations with tape. Cut off excess material after concrete has been installed and reviewed by the Architect

# 3.3 PROTECTION

- A. Protect sheets from puncture during installation. Patch and seal punctures before proceeding with subsequent construction and just before placing concrete.
- B. Install runway planks in construction traffic lanes until slabs are placed.
- C. Patches: Lay patch over damaged areas and seal around patch using same method described above for overlapping sheets.

# END OF SECTION 07 26 10

# SECTION 07 92 00 - JOINT SEALANTS

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Silicone joint sealants.
  - 2. Latex joint sealants.
  - 3. Insulating joint sealants.

## 1.2 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.
- D. Product test reports.
- E. Warranties.

### 1.3 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

## 1.4 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish 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: Two years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 MATERIALS, GENERAL

- A. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint 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 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.

### 2.2 SILICONE JOINT SEALANTS

- A. Silicone Joint Sealant S-GP: ASTM C 920.
  - 1. Type: Single component (S).
  - 2. Grade: Nonsag (NS).
  - 3. Class: 25.
  - 4. Uses Related to Exposure: Nontraffic (NT), G, A, O.
  - 5. Single component, neutral curing, non-staining, non-bleeding silicone sealant.
  - 6. Medium modulus silicone for metal to metal and metal to adjacent substrates; Low modulus silicone for all other locations.
  - 7. Joint movement range without cohesive/adhesive failure: Plus 50 percent to minus 50 percent of joint width.
  - 8. Color: Selected by Architect from manufacturer's full color range .
  - 9. Acceptable Medium Modulus Products:
    - a. 795, Dow Corning.
    - b. Silpruf, General Electric.
    - c. 864, Pecora.
    - d. Spectrem 2, Tremco.
  - 10. Acceptable Low Modulus Products:
    - a. 790, Dow Corning.
    - b. 890, Pecora.
    - c. Spectrem 1, Tremco.
- B. Silicone–Sanitary (S-S): ASTM C 920:
  - 1. Type: S
  - 2. Grade: NS
  - 3. Class: 25
  - 4. Uses: NT, M, G, A, O
  - 5. Neutral or acid curing, non-staining, non-bleeding, fungicide-containing.
  - 6. Color: White.
  - 7. Acceptable Products:
    - a. 786 Mildew-Resistant Silicone Sealant, The Dow Chemical Company.
    - b. Sanitary 1700, General Electric Silicones.
    - c. Tremsil 200 Sanitary, Tremco

# 2.3 LATEX JOINT SEALANTS

- A. Acrylic Latex Joint Sealant (AL)
  - 1. ASTM C834.
  - 2. Non-sag; non-staining; non-bleeding.
  - 3. Joint movement range without cohesive/adhesive failure: Plus 7.5 percent to minus 7.5 percent of joint width.
  - 4. Color: As selected by Architect from manufacturer's full color range.
- B. Acceptable Products:
  - 1. AC-20, Pecora Corporation.
  - 2. Sonolac, Sonneborn Building Products.
  - 3. Acrylic Latex Tremflex 834, Tremco, Inc.

# 2.4 INSULATING JOINT SEALANTS

- A. Insulating Air Foam Sealant (AF)
  - 1. Insulating two component polyurethane foam air sealant.
  - 2. Provide material manufactured to stop air and vapor leakage to exterior assemblies.
  - 3. Provide high yield, quick curing materials.
  - 4. Provide in two component containers with gun applicator and nozzle lengths as necessary to reach voids.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Zerodraft Insulating Air Sealant, BASF Corporation.

### 2.5 JOINT SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type 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.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

### 2.6 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.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

# PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
  - 1. Remove laitance and form-release agents from concrete.
  - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. 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.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.

- 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.
- G. 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.

### 3.3 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces; S-GP.
  - 1. Joint Sealant: Silicone, General Purpose.
  - 2. Joint Locations:
    - a. Perimeter joints between exterior wall surfaces.
    - b. Other joints as indicated.
- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces; AL.
  - 1. Joint Sealant: Latex.
  - 2. Joint Locations:
    - a. Perimeter joints of exterior openings where indicated.
    - b. Tile control and expansion joints.
    - c. Vertical joints on exposed surfaces of interior partitions.
    - d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    - e. Other joints as indicated.
- C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces; S-S.
  - 1. Joint Sealant: Silicone, Sanitary.
  - 2. Joint Sealant Location:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
    - c. Other joints as indicated.
- D. Joint-Sealant Application: Interior air gaps, cracks, joints, and holes at exterior assemblies.
  - 1. Joint Sealant: Air Foam (AF).
  - 2. Joint Location:
    - a. Connections at wall and deck junctions.
    - b. Connections at exterior building components.
    - c. Holes and cracks at exterior walls.

### END OF SECTION 07 92 00

# SECTION 08 12 13 - HOLLOW METAL FRAMES

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes: Interior standard hollow frames.
- B. Related Sections:
  - 1. Division 8 Section "Flush Wood Doors" for doors installed in metal frames.
  - 2. Division 8 Section "Door Hardware" for hardware requirements.

## 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

### PART 2 - PRODUCTS

# 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Amweld Building Products, LLC.
  - 2. Benchmark; a division of Therma-Tru Corporation.
  - 3. Ceco Door Products; an Assa Abloy Group company.
  - 4. Curries Company; an Assa Abloy Group company.

## 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B.
- C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Zcoating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Mineral-Fiber Insulation: ASTM C 665, Type I.

## 2.3 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8.
- B. Interior Frames: Fabricated from cold-rolled steel sheet.
  - 1. Fabricate frames with mitered or coped corners.
  - 2. Fabricate frames as full profile welded unless otherwise indicated.
  - 3. Frames for Wood Doors: 0.053-inch-ick steel sheet.
- C. Hardware Reinforcement: ANSI/SDI A250.6.

## 2.4 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

### 2.5 MOLDINGS

A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

### 2.6 FABRICATION

- A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- B. Hollow Metal Frames:
  - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  - 2. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  - 3. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.

- 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
- 5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
- 4. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.
  - a. Single-Door Frames: Three door silencers.
  - b. Double-Door Frames: Two door silencers.
- C. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
  - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
  - 2. Reinforce frames to receive nontemplated, mortised and surface-mounted door hardware.
  - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
  - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 electrical Sections.

### 2.7 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Hollow Metal Frames: Comply with ANSI/SDI A250.11.
  - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - b. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
  - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
  - 4. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

d. Plumbness: Plus or minus 1/16 inch measured at jambs at floor.

# 3.2 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 08 12 13

# SECTION 08 14 16 - FLUSH WOOD DOORS

# PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes:
  - 1. Solid-core doors with wood-veneer faces.
  - 2. Factory fitting flush wood doors to frames and factory machining for hardware.

# B. Related Sections:

- 1. Division 08 Section "Hollow Metal Frames" for interior hollow metal door frames
- 2. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for interior aluminum door frames.
- 3. Division 08 Section "Door Hardware" for hardware requirements.
- 4. Division 08 Section "Glazing" for glass view panels in flush wood doors.
- 5. Division 09 Section "Painting" for field finishing flush wood doors.

# 1.2 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; location and extent of hardware blocking; mortises, holes, and cutouts; requirements for veneer matching; factory finishing; and other pertinent data.
- C. Door Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.
- D. Samples: For each face material and finish for approval of stain color.

### 1.3 QUALITY ASSURANCE

A. Quality Standard: Comply with NWWDA I.S.1-A, "Architectural Wood Flush Doors."

### PART 2 - PRODUCTS

# 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. GRAHAM Manufacturing Corp.
  - 2. Lynden Door.
  - 3. Vancouver Door Company, Inc.
  - 4. VT Industries Inc.

# 2.2 DOOR CONSTRUCTION

- A. WDMA I.S.1-A Performance Grade:
  - 1. Heavy Duty unless otherwise indicated.
- B. Particleboard-Core: ANSI A208.1, Grade LD-2, Density for 5-ply doors: 32 lbs/ft<sup>3</sup> density made with binder containing no urea-formaldehyde resin.
- C. Solid Core Doors for Field Applied Transparent Finish:
  - 1. Grade: Premium, with Grade A faces.
  - 2. Species and Cut: Plain sliced white maple.
  - 3. Match between Veneer Leaves: Book match.
  - 4. Assembly of Veneer Leaves on Door Faces: Balance match.
  - 5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
  - 6. Core: Particleboard.
  - 7. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
  - 8. Adhesives: Type I per WDMA TM-6.
  - 9. Finish: Stain to match WilsonArt, Studio Teak 7960K-18.

### 2.3 LOUVERS AND LIGHT FRAMES

A. Wood-Veneered Beads for Light Openings: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces.

### 2.4 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting.
- B. Factory machine doors for hardware that is not surface applied.
- C. Openings: Cut and trim openings through doors in factory.
  - 1. Light Openings: Trim openings with moldings of material and profile indicated.
  - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

### PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
- B. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

END OF SECTION 08 14 16

# SECTION 08 31 13 - ACCESS DOORS AND FRAMES

# PART 1 - GENERAL

# 1.1 SUMMARY

- A. Section Includes:
  - 1. Access doors and frames for walls and ceilings.

# 1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Frame Anchors: Same type as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

# 2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
  - 2. Karp Associates, Inc.
  - 3. Larsen's Manufacturing Company.
  - 4. Milcor Inc.
  - 5. Nystrom, Inc.
  - 6. Williams Bros. Corporation of America (The).

- B. Flush Access Doors with Exposed Flanges:
  - 1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standardwidth exposed flange, proportional to door size.
  - 2. Locations: Tile Walls.
  - 3. Uncoated Steel Sheet for Door: Nominal 0.060 inch 16 gage.
    - a. Finish: Factory prime.
  - 4. Frame Material: Same material, thickness, and finish as door.
  - 5. Hinges: Manufacturer's standard.
  - 6. Hardware: Cam latch operated by screwdriver.
- C. Flush Access Doors with Concealed Flanges:
  - 1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
  - 2. Locations: Wall and ceiling.
  - 3. Uncoated Steel Sheet for Door: Nominal 0.060 inch 16 gage
    - a. Finish: Factory prime.
  - 4. Frame Material: Same material and thickness as door.
  - 5. Hinges: Manufacturer's standard.
  - 6. Hardware: Cam latch operated by screwdriver.
- D. Hardware:
  - 1. Latch: Cam latch operated by screwdriver.

### 2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roller trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

# 2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
  - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

# PART 3 - EXECUTION

- 3.1 INSTALLATION
  - A. Comply with manufacturer's written instructions for installing access doors and frames.
  - B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

## 3.2 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

### END OF SECTION 08 31 13

# SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

# PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Aluminum-framed storefront systems.
  - 2. Aluminum-framed entrance door systems.

# B. Related Sections:

- 1. Division 08 Section "Wood Doors" for solid wood doors installed in storefront frames.
- 2. Division 08 Section "Door Hardware" for entrance door hardware requirements.
- 3. Division 09 Section "Glazing" for glazing requirements.

### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
- C. Color Samples: For each type of exposed finish required.
- D. Other Action Submittals:
  - 1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.
- E. Product test reports.
- F. Field quality-control reports.
- G. Maintenance data.
- H. Warranties: Sample of special warranties.

### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- D. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
- E. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

# 1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration caused by thermal movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Adhesive or cohesive sealant failures.
    - e. Water leakage through fixed glazing and framing areas.
  - 2. Warranty Period: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
  - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
  - 2. Dimensional tolerances of building frame and other adjacent construction.
  - 3. Failure includes the following:
    - a. Deflection exceeding specified limits.
    - b. Thermal stresses transferring to building structure.
    - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
    - d. Noise or vibration created by wind and by thermal and structural movements.
    - e. Loosening or weakening of fasteners, attachments, and other components.
    - f. Failure of operating units.

- C. Wind Loads: As indicated on Structural Drawings, General Structural Notes.
- D. Deflection of Framing Members:
  - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
  - 2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.
- E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
  - 1. Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall when subjected to specified design pressures shall not exceed 1/175 of its clear span.
- F. Temperature Change (Range): Systems accommodate 120 deg F ambient; 180 deg F material surfaces.
- G. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
- H. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- I. Energy Efficiency: Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than 0.32 when incorporating glass specified in Division 09 Section "Glazing".

# 2.2 STOREFRONT SYSTEMS

- A. Basis-of-Design Product: The design for aluminum-framed systems is based on Kawneer Tri-Fab VG 451T (exterior), VG 451 (interior), center glazed. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  - 1. EFCO Corporation.
  - 2. Kawneer.
  - 3. United States Aluminum.
- B. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  - 1. Framing Construction: Non-thermally broken.
  - 2. Glazing System: Retained mechanically with gaskets on four sides.
  - 3. Glazing Plane: Center.
- C. Aluminum:
  - 1. ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.

- 2. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
  - 1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- G. Glazing Gaskets:
  - 1. Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
  - 2. Conform to ASTM C509 or C864.
  - 3. Profile and hardness as required to maintain uniform pressure for watertight seal.
  - 4. Provide in manufacturer's standard black color.
- H. Weatherstripping:
  - 1. Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
  - 2. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.
- I. Internal Sealants: Types recommended by sealant manufacturer.
- J. "Anti-Walk" Edge Blocking: "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.
- K. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.

### 2.3 SWING ENTRANCE DOOR SYSTEMS

- A. Manufacturer: Provide entrance doors from same manufacturer as storefront framing manufacturer.
  - 1. Basis of Design: Kawneer AA425 Thermal Entrance Door.
- B. Entrance Doors: Manufacturer's standard-duty, glazed entrance doors for manual-swing operation.

- 1. Door Construction: 2-1/4-inch overall thickness, with minimum 0.125-inch-thick, extrudedaluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
  - a. Thermal Construction at Exterior Doors: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
- 2. Door Design: Narrow stile; 2-1/2-inch nominal width.
  - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
- C. Entrance Door Hardware:
  - 1. Unless otherwise indicated, aluminum door manufacturer to provide, weather seals, and door bottoms.
  - 2. Balance of hardware furnished by the hardware supplier is specified in Division 08 Section "Door Hardware."

# 2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

# 2.5 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

## 2.6 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 1. Sheet and Plate: ASTM B 209.
  - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
  - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
  - 4. Structural Profiles: ASTM B 308.
  - 5. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
  - 1. Structural Shapes, Plates, and Bars: ASTM A 36.
  - 2. Cold-Rolled Sheet and Strip: ASTM A 1008.
  - 3. Hot-Rolled Sheet and Strip: ASTM A 1011.

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# 2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Coordination of Fabrication:
  - 1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
  - 2. Fabricate units to withstand loads which will be applied when system is in place.
- C. General:
  - 1. Conceal fasteners wherever possible.
  - 2. Reinforce work as necessary for performance requirements and for support to structure.
  - 3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or pre-formed separators which will prevent contact and corrosion.
  - 4. Comply with Section 08810 for glazing requirements.

## D. Aluminum Framing:

- 1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
- 2. Fabricate frame assemblies with joints straight and tight fitting.
- 3. Reinforce internally with structural members as necessary to support design loads, including sunshade system.
- 4. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
- 5. Seal horizontals and direct moisture accumulation to exterior.
- 6. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
- 7. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
- 8. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.
- 9. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- I. Entrance Doors:
  - 1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
  - 2. Provide extruded aluminum glazing stops of square design, permanently anchored on security side and removable on opposite side.

# J. Hardware:

- 1. Receive hardware supplied in accordance with Section 08 71 00 and install in accordance with requirements of this Section.
- 2. Cut, reinforce, drill and tap frames and doors as required to receive hardware.
- 3. Comply with hardware manufacturer's templates and instructions.
- 4. Use concealed fasteners wherever possible.
- K. Welding:
  - 1. Comply with recommendations of the American Welding Society.
  - 2. Use recommended electrodes and methods to avoid distortion and discoloration.
  - 3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.
- L. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

# 2.8 ALUMINUM FINISHES

- A. Exterior Systems (match existing):
  - 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. Interior Systems:
  - 1. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
    - a. Color: Black.

### PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure nonmovement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
  - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
  - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
  - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Division 08 Section "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
  - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

END OF SECTION 08 41 13
# SECTION 08 71 00 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same.
- B. Hardware items are listed with product manufacturer and model numbers. These are listed as a basis of design only and do not limit the use of other approved manufacturer's products. A list of pre-approved substitute products is listed at the end of the hardware schedules.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for hardware used with entrance doors.
  - 2. Division 8 Section "Flush Wood Doors" for factory prefitting and factory premachining of doors for door hardware.

## 1.2 SUBMITTALS

- A. Product data including manufacturers' technical product data for each item of door hardware installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- B. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
    - a. Type, style, function, size, and finish of each hardware item.
    - b. Name and manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
    - e. Explanation of all abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for hardware.
    - g. Door and frame sizes and materials.
  - 2. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
  - 3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

C. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

## 1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
- C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

### 1.4 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

### 1.5 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Butts and Hinges:
    - a. Bommer Industries, Inc.
    - b. Hager Hinge Co.
    - c. Stanley Hardware.\*
  - 2. Locks and Latches:
    - a. Marks USA
  - 3. Cylinders:
    - a. Best Access Systems (Furnished by Owner)
  - 4. Overhead Closers:
    - a. LCN, Div. Allegion Hardware.
    - b. Norton Door Controls, Div. Assa-Abloy.\*
  - 5. Door Control Devices:
    - a. Glynn-Johnson, Div. Allegion Hardware..
    - b. Rockwood Manufacturing Company.
    - c. Ives, Div. Allegion Hardware.\*
  - 6. Electric Strikes:
    - a. Adams-Rite (Furnished by Owner)
  - 7. Door Pulls
    - a. Rockwood Manufacturing Company.\*

## 2.2 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:
  - 1. Hinges: Stanley Hardware.
  - 2. Locks: Marks USA
  - 3. Overhead Closers: LCN.
  - 4. Overhead Stops: Glynn-Johnson.
  - 5. Door Controls: Ives.
  - 6. Electric Strikes: Adams-Rite

- 7. Door Pulls: Rockwood
- B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.
- C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
- E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

## 2.3 HINGES, BUTTS, AND PIVOTS

- A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Screws: Provide Phillips flat-head screws complying with the following requirements:
  - 1. For metal doors and frames install machine screws into drilled and tapped holes.
  - 2. For wood doors and frames install wood screws.
  - 3. For fire-rated wood doors install #12 x 1-1/4-inch, threaded-to-the-head steel wood screws.
  - 4. Finish screw heads to match surface of hinges or pivots.
- C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - 1. Out-Swing Exterior Doors: Nonremovable pins.
  - 2. Out-Swing Corridor Doors with Locks: Nonremovable pins.
  - 3. Interior Doors: Nonrising pins.
  - 4. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.
- D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.
  - 1. Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 86 inches or less in height with same rule for additional hinges.

# 2.1 LOCK CYLINDERS AND KEYING

A. All locks shall be furnished to accept Best interchangeable cylinder cores.

B. All permanent lock cylinders shall be furnished by the owner and installed by contractor.

## 2.2 LOCKS, LATCHES, AND BOLTS

- A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.
  - 1. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.
  - 2. Provide extra long strike lips for locks used on frames with applied wood casing trim.
  - 3. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
  - 4. Provide dust-proof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolt.
  - 5. Provide roller type strikes where recommended by manufacturer of the latch and lock units.
- B. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
  - 1. Provide 1/2-inch minimum throw of latch for other bored and preassembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.
- C. Flush Bolt Heads: Minimum of 1/2-inch-diameter rods of brass, bronze, or stainless steel with minimum 12-inch-long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.
- D. Exit Device Dogging: Except on fire-rated doors where closers are provided on doors equipped with exit devices, equip the units with keyed dogging device to keep the latch bolt retracted, when engaged.
- E. Rabbeted Doors: Where rabbeted door stiles are indicated, provide special rabbeted front on lock and latch units and bolts.

## 2.3 PULL UNITS

A. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation, thru-bolted for matched pairs but not for single units.

## 2.4 CLOSERS AND DOOR CONTROL DEVICES

- A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.
  - 1. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.
- B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

C. Combination Door Closers and Holders: Provide units designed to hold door in open position under normal usage and to release and close door automatically under fire conditions. Incorporate an integral electromagnetic holder mechanism designed for use with UL listed fire detectors, provided with normally closed switching contacts.

## 2.5 DOOR TRIM UNITS

- A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
- B. Fabricate protection plates not more than 1-1/2 inches less than door width on hinge side and not more than 1/2 inch less than door width on pull side by height indicated.

### 2.6 WEATHERSTRIPPING AND SEALS

- A. General: Provide continuous weatherstripping on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.
- C. Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface applied unless shown as mortised or semimortised, and of following metal, finish, and resilient bumper material:
- D. Weatherstripping at Door Bottoms: Provide threshold consisting of contact-type resilient insert and metal housing of design and size shown and of following metal, finish, and resilient seal strip:

### 2.7 THRESHOLDS

A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.

### 2.8 HARDWARE FINISHES

- A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).
- B. Provide finishes that match those established by BHMA or, if none established, match the Architect's sample.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

- E. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
- F. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
  - 1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment Substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers."
- F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

### 3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
  - 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- B. Clean adjacent surfaces soiled by hardware installation.

- C. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
- D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:
  - 1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
  - 2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
  - 3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
  - 4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

## 3.3 HARDWARE SCHEDULE

- A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
  - 1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.

### 3.4 DOOR HARDWARE SETS

HW – 1 (Main Entry)

2	Each	Power Transfer	EPT-10 689		
2	Each	Door Pull	Rockwood RM3240 630		
2	Each	RIM Exit Device	TS2403x2903Ax630xs458xMLRx3'-0"x7'-0"x1 <sup>3</sup> / <sub>4</sub> "		
2	Each	IC Cylinder	12E72		
1	Each	Removable Mullion	KR822		
1	Each	Concealed Closer	2034 689		
1	Each	Spacer	4040XP-61		
1	Each	Auto-Equalizer	4642 REG		
2	Each	Overhead Stop	104S		
1	Each	Actuator, Jamb Mount	8310-818		
1	Each	Actuator, Wall Mount	8310-853		
Pivots, Weather Seals and Door Bottoms by Door Manufacturer					
Access Control and 24VDC Power Supply by Others					

HW – 2 (Existing Exterior to Hall)

All Hdwr. Existing to be Re-used1EachElectric Strike4500 US32DAccess Control by Others

HW - 3 (Offices)

4 1 1 3	Each Each Each Each	Hinges Office Set Wall Stop Silencer	5BB1 4.5X4.5 652 IVE T511B7D D 626 FAL WS407CCV 630 IVE SR64 GRY IVE	
HW – 4 (Conference)				
4 1 1 3	Each Each Each Each	Hinges Passage Set Wall Stop Silencer	5BB1 4.5X4.5 652 IVE T101S D 626 FAL WS407CCV 630 IVE SR64 GRY IVE	
HW – 5 (Restrooms, Shower)				
3 1 1 3	Each Each Each Each Each	Hinges Privacy Set Indicator Deadbolt Wall Stop Silencer	5BB1 4.5X4.5 652 IVE T301S D 626 FAL D271 626 FAL WS407CCV 630 IVE SR64 GRY IVE	
HW – 6 (ATM/Night Drop, Server, Janitor)				
3 1 1 1 1 3 Acce	Each Each Each Each Each Each Each Each	Hinges Indicator Deadbolt Storeroom Set Electric Strike Closer Wall Stop Silencer ol by Others	5BB1 4.5X4.5 652 IVE D271 626 FAL T581B7D D 626 FAL 4500 630 HES 4040XP EDA 689 LCN WS407CCV 630 IVE SR64 GRY IVE	
HW – 7 (Storage)				
3 1 1 3	Each Each Each Each Each	Hinges Storeroom Set Closer Wall Stop Silencer	5BB1 4.5X4.5 652 IVE T581B7D D 626 FAL 4040XP EDA 689 LCN WS407CCV 630 IVE SR64 GRY IVE	
HW – 7 (Breakroom)				
3 1 1 1 3	Each Each Each Each Each Each	Hinges Office Set Closer Wall Stop Silencer	5BB1 4.5X4.5 652 IVE T511B7D D 626 FAL 4040XP EDA 689 LCN WS407CCV 630 IVE SR64 GRY IVE	

# END OF SECTION 08 71 00

# SECTION 08 80 00 - GLAZING

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Storefront framing.
  - 2. Interior wood door lites.
  - 3. Back painted glass.

## 1.2 DEFINITIONS

- A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- B. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

### 1.3 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 thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) 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: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
    - b. 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.
      - 1) Load Duration: 60 seconds or less.
    - c. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

- 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, ambient; 180 deg F, material surfaces.

### 1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated. Include performance characteristics for exterior glass, including shading coefficient, visible light transmittance, and U value.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square with specified tints and glazing films.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

## 1.5 QUALITY ASSURANCE

- A. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
- B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. IGMA Publication for Insulating Glass: SIGMATM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

## 1.6 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coatedglass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminatedglass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that

deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

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

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cardinal IG, Minneapolis, MN.
  - 2. Ford Motor Co., Glass Division, Detroit, MI.
  - 3. PPG Industries, Inc., Cheswick, PA (Basis of Design).
  - 4. Guardian Industries Corp, Corsicana, TX
  - 5. Viracon, Owatonna, MN.

## 2.2 GLASS PRODUCTS

- A. GL 1: Clear Float Glass:
  - 1. Glazing select, float, ASTM C1036, Type I, Class 1, Quality q3.
  - 2. Type: Annealed; tempered where required.
  - 3. Thickness: Minimum 1/4 inch.
- B. GL 2: Laminated Glass:
  - 1. Laminated Glass: ASTM C 1172, tempered both faces.
  - 2. Interior Layer: polyvinyl butyral interlayer, ionomeric polymer interlayer or cast-in-place and cured-transparent-resin interlayer.
  - 3. Thickness: Minimum 5/8 inch.
  - 4. Butt Edges: Flat ground.
  - 5. Corner Edges: Lap-joint corners with exposed edges polished.
  - 6. Lites: Clear.
- C. GL 3: Insulating Vision Glass:
  - 1. Double glazed, hermetically sealed around perimeter with continuous metal spacer filled with moisture absorbing desiccant, ASTM E2190, adhered to glass lights with:
  - 2. Primary Seal: Polyisobutylene.
  - 3. Secondary Seal: Silicone two-part.
  - 4. Total Thickness: 1-inch.
    - a. Outer Light: Glazing select, float, ASTM C1036.
      - 1) Type: Annealed; tempered where required by code and project conditions
      - 2) Thickness: 1/4-inch.
      - 3) Lite: Clear.
      - 4) Low-E Coating: Solarban 70 (2), Vitro Architectural Glass.

- b. Inner Light: Glazing select, float.
  - 1) Type: Annealed; tempered where required by code and project conditions
  - 2) Thickness: 1/4-inch.
  - 3) Lite: Clear.
- c. Air Space: 1/2-inch dehydrated air space.
- 5. Performance Criteria:
  - a. Winter U-value: 0.28.
  - b. Visible Light Transmission: 64%.
  - c. Outdoor Visible Light Reflectance: 13%.
  - d. Solar Heat Gain Coefficient: 0.27.
  - e. Light to Solar Gain: 2.37.
- D. GL 4: Back Painted Low-Iron Glass:
  - 1. Glazing select, float, ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3 with exposed edges seamed before tempering.
  - 2. Type: Tempered.
  - 3. Thickness: Minimum 1/4 inch.
  - 4. Edge Treatment: Smooth polished edge with eased corners.
  - 5. Surface: Glossy.
  - 6. Color: White.
  - 7. Basis of Design: Skyline Design Backpainted Glass Panel, White.

## 2.3 GLAZING GASKETS

- A. 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.
  - 4. Thermoplastic polyolefin rubber.
  - 5. Any material indicated above.

### 2.4 GLAZING TAPES

- A. 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.

## 2.5 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, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type 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. Adhesives for Wall Attachment: Mildew-resistant, low VOC, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by back painted glass manufacturer.

### 2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

## PART 3 - EXECUTION

### 3.1 GLAZING

- A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
  - 1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
  - 2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
  - 3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
  - 4. 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.
  - 5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
  - 6. Provide spacers for glass lites where length plus width is larger than 50 inches.

- 7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
  - 1. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
  - 2. 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.
  - 3. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
  - 4. Apply cap bead of elastomeric sealant over exposed edge of tape.
- C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
  - 1. 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.
  - 2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
  - 3. Install gaskets so they protrude past face of glazing stops.
- D. Butt Glazing: Install butt-joint sealants according to manufacturer's instructions.
  - 1. Seal edge of laminated glass prior to applying sealant.
  - 2. Test compatibility of sealant with inner layer to ensure no edge deterioration during curing process.

## 3.2 BACK PAINTED GLASS

- A. General: Install back painted glass in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Adhere to wall surfaces with egg-size adhesive gobs at 16 inches o.c., horizontally and vertically.

## 3.3 GLAZING FILM

A. Apply glazing film following manufacturer's written instructions. Clean glass thoroughly prior to applying glazing to inside face of glazing unit.

## 3.4 CLEANING AND PROTECTION

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. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 08 80 00

# SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
  - 2. Suspension systems for interior gypsum ceilings and soffits.

## 1.2 SUBMITTALS

A. Product Data: For each type of product.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Minimum Base Metal Thickness: Determine base metal thickness of metal framing on manufacturer's limiting wall height tables for interior non-structural non-composite framing and the following criteria:
  - 1. Lateral load: five psf.
  - 2. Deflection:
    - a. L/240 for gypsum board with painted finish.
    - b. L/360 for gypsum board with tile finish

### 2.2 STEEL FRAMING

- A. Steel Framing, General: Comply with ASTM C 754 for conditions indicated.
  - 1. Steel Sheet Components: Metal complying with ASTM C 645 requirements.
    - a. Protective Coating:
      - 1) Interior Applications: Manufacturer's standard corrosion-resistant zinc coating.
- B. Suspended Ceiling and Soffit Framing:
  - 1. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.
  - 2. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
  - 3. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch-wide flange, and in depth indicated.

- 4. Furring Channels (Furring Members): Cold Rolled Channels, 0.0538-inch bare steel thickness, with minimum 1/2-inch-wide flange, 3/4 inch deep.
- C. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
- D. Partition and Soffit Framing:
  - 1. Steel Studs and Runners: ASTM C 645, in depth indicated.
    - a. Minimum Base Metal Thickness: As required to meet performance requirements.
  - 2. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch-eep flanges.
  - 3. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
    - a. Minimum Base Metal Thickness: As required to meet performance requirements.

## 2.3 AUXILIARY MATERIALS

- A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt or foam gasket.

## PART 3 - EXECUTION

- 3.1 INSTALLATION, GENERAL
  - A. Installation Standard: ASTM C 754.
  - B. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
  - C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
  - D. Install bracing at terminations in assemblies.
  - E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.2 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

### 3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
  - 3. Do not attach hangers to steel roof deck.
  - 4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  - 5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  - 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

# SECTION 09 29 00 - GYPSUM BOARD

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Interior gypsum wallboard.
  - 2. Sound attenuation blankets.

#### 1.2 SUBMITTALS

A. Product Data: For each product indicated.

#### 1.3 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.

### PART 2 - PRODUCTS

### 2.1 PANEL PRODUCTS

- A. Panel Size, General: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Gypsum Wallboard: ASTM C 36.
  - 1. Regular Type: In thickness indicated and with long edges tapered.
  - 2. Type X: In thickness indicated and with long edges tapered.
- C. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
  - 1. Core: As indicated.
  - 2. Thickness: 5/8-inch.
  - 3. Long Edges: Tapered.
  - 4. Mold Resistance: ASTM D 3273, score of 10.
  - 5. Location: Washrooms.

# 2.2 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

- 1. Cornerbead: Use at outside corners.
- 2. LC-Bead: Use at exposed panel edges.
- 3. Expansion (Control) Joint: Use where indicated.
- 2.3 JOINT TREATMENT MATERIALS
  - A. General: Comply with ASTM C 475.
  - B. Joint Tape:
    - 1. Interior Gypsum Wallboard: Paper.
  - 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. Comply with ASTM C 475.
    - 2. Board manufacturer's standard ready-mixed joint compounds.
    - 3. Compounds specifically manufactured for topping coats are not permitted for first coat on metal trim and taping.
    - 4. Use board manufacturer's joint compound unaffected by humidity at moisture-resistant gypsum board.
    - 5. Mixing:
      - a. Mix compounds in strict accordance with manufacturer's directions.
      - b. Mix only enough at one time to be used during recommended pot life of compound.

## 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. 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 thick.
- C. 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.

## PART 3 - EXECUTION

- 3.1 PANEL PRODUCT INSTALLATION
  - A. Gypsum Board: Comply with ASTM C 840 and GA-216.
    - 1. Space screws a maximum of 12 inches o.c. for vertical applications.
    - 2. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.
    - 3. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.

- 4. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
  - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
  - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
- 5. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

## 3.2 FINISHING

- A. Installing Trim Accessories: 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. Finishing Gypsum Board Panels: 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.
  - 1. Prefill open joints and damaged surface areas.
  - 2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- C. Gypsum Board Finish Levels: Finish panels to Level 4, according to ASTM C 840 and as follows:
  - 1. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges.

# END OF SECTION 09 29 00

SECTION 09 30 00 - TILE

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Ceramic and porcelain tile.

### 1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples:
  - 1. Each type, composition, color, finish of tile, and grout.
  - 2. Samples shall be no larger than 8.5" x 11".

## PART 2 - PRODUCTS

## 2.1 TILE PRODUCTS

- A. Refer to the Finish Legend on the Drawings for product information.
- B. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

### 2.2 SETTING AND GROUTING MATERIALS

- A. Polymer Modified Dryset Mortar: (Thin Set): ANSI A118.1.
- B. Latex-Modified Tile Grout: ANSI A118.7, color as indicated.

### 2.3 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials.
- B. Metal Edge Transition Strips: Transition between carpet and tile.
  - 1. Material: Extruded aluminum, to ASTM B221, 6463-T5 alloy.
  - 2. Size: 1/8 inch wide at top edge; with integral perforated anchoring leg.
  - 3. Height: As required to suit application.
  - 4. Finish: Brushed Stainless Steel
  - 5. Acceptable Product: Schlüter<sup>®</sup>-SCHIENE-ACB.

C. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

# PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tilesetting material manufacturer's written instructions.
- C. Remove protrusions, bumps, and ridges by sanding or grinding.
- D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- E. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

# 3.2 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Expansion Joints: Locate expansion joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
  - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

- H. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.
- I. Install tile on floors and walls with the following joint widths:
  - 1. Tile: 1/16 inch.
- J. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

### 3.3 FLOOR TILE INSTALLATION SCHEDULE

- A. Interior floor installation on concrete; thin-set mortar; TCNA F113.
  - 1. Thin-Set Mortar: Dry-set portland cement mortar.
  - 2. Grout: Latex or Polymer-modified sanded grout.

# 3.4 WALL TILE INSTALLATION SCHEDULE

- A. Interior wall installation; thin-set mortar; over gypsum board; TCNA W243.
  - 1. Thin-Set Mortar: Dry-set portland cement mortar.
  - 2. Grout: Latex or Polymer-modified unsanded grout.

# END OF SECTION 09 30 00

# SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

## 1.2 SYSTEM REQUIREMENTS

- A. Interface With Other Systems: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components and partition system.
- B. Interior Suspended Ceilings, Soffits, and Bulkheads: Maintain deflection of not more than L/360 of distance between supports.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

# 1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Evaluation reports.
- C. Field quality-control reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- 1.6 QUALITY ASSURANCE
  - A. Testing Agency Qualifications: Qualified according to NVLAP.

## PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
  - 2. Smoke-Developed Index: 50 or less.

## 2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

- A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 35 percent.
- C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- D. Acoustical Panel Standard: Comply with ASTM E 1264.
- E. Metal Suspension System Standard: Comply with ASTM C 635.
- F. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

### 2.3 ACOUSTICAL PANELS AND SUSPENSION SYSTEMS

- A. Basis-of-Design Products:
  - 1. ACT-1 (Interior System):
    - a. Panel:
      - 1) Manufacturer: Armstrong.
      - 2) Style: Dune, #1775.
      - 3) Size: 24"x24"x5/8".
      - 4) Edge: Angled tegular.
      - 5) Color: White.
    - b. Suspension System:
      - 1) Manufacturer: Armstrong.
      - 2) Style: Suprafine XL.
      - 3) Face Width: 9/16" exposed tee.
      - 4) Color: White.

- B. Acceptable Manufacturers:
  - 1. Armstrong World Industries.
  - 2. Certainteed Ceilings, Tampa, FL.
  - 3. USG Interiors, Inc., Chicago, IL.
- C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
- D. Suspension System Accessories:
  - 1. Manufacturer's standard trim and edge moldings to suit suspension system requirements; same finish as suspension system.
  - 2. Provide edge moldings to fit penetrations exactly, including circular penetrations.
  - 3. Provide hold-down clips, splices, stabilizer bars, and seismic braces required for suspended grid system.
- E. Attachment Devices:
  - 1. General: Size devices for 5 times loads imposed by complete system.
  - 2. Hanger Wire Form Inserts: No. 6 galvanized wire loop and 26 gage galvanized shell, or 14 gage galvanized steel strap with 5/16 inch hole.
  - 3. Hanger Anchorage Devices: Screws, clips, bolts, or other devices applicable to indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven though standard construction practices or by certified test data.
  - 4. Hangers:
    - a. As recommended by manufacturer and as required to comply with structural classification.
    - b. Wire Hangers: ASTM A641, not less than 12 gage, galvanized carbon steel wire, soft temper, pre-stretched.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook" except for more stringent requirements of manufacturer or these specifications.
  - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
  - 2. CISCA Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies."
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

- 1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
- 2. Install edge moldings where ceilings abut walls, partitions or other penetration elements. Miter cut inside and outside corners to provide flush, tight, hairline joints.

END OF SECTION 09 51 13

# SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Resilient base.
  - 2. Transition strips.

### 1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: Full-size units of each color for verification.

### 1.3 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg or more than 95 deg F in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F
- C. Install resilient products after other finishing operations, including painting, have been completed.

### PART 2 - PRODUCTS

- 2.1 RESILIENT WALL BASE
  - A. Basis of Design: Refer to Finish Legend
  - B. Material:
    - 1. Rubber.
    - 2. Gage: 1/8.
    - 3. Provide with matching end stops.
    - 4. Standard top-set cove
    - 5. Provide in rolls.
    - 6. Corners: Job-formed.

# 2.2 TRANSITION STRIPS

- A. Reducer Strips:
  - 1. Material: Homogeneous vinyl or rubber composition.
  - 2. Width: 1 inch, minimum at linoleum, 2 inch minimum at carpet.
  - 3. Align flush with top of flooring material on side of strip.
  - 4. Tapered or bullnose edge on side opposite of flooring.
  - 5. Colors: Johnsonite, Burnt Umber.

### 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. 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.
- C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- D. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
  - 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- E. 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. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Resilient Base:
  - 1. Use longest lengths possible; pieces less than 10 feet long are not permitted. Seams are not permitted between wall corners spaced less than 10 feet apart.
  - 2. Fit joints straight, tight, and vertical.
  - 3. Install on solid substrate backing.

- 4. Bond tight to wall and floor surfaces.
- 5. Scribe to door frames and other interruptions.
- 6. Outside Corners: Wrap base around corner after using cove base groover tool by Gundlach to make V-shaped vertical cut in back of base at corner.
- 7. Inside Corners:
  - a. Butt and cope, or mitered.
  - b. Do not wrap base around corners.
- 8. Align tops of adjacent sections.
- 9. Change from cove base to straight base at flooring transition strips.
- B. Reducer and Transition Strips:
  - 1. Provide reducer strips at unprotected edges, exposed edges, and where flooring terminates.
  - 2. Provide transition strips at transitions from resilient flooring to carpet.
  - 3. Center strip under door where flooring terminates at door openings.
  - 4. Install in longest lengths practicable with minimal joints.
  - 5. Fit joints tightly.
  - 6. Secure resilient strips to subfloor by using adhesive.

## 3.3 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.

END OF SECTION 09 65 13

# SECTION 09 65 19 - RESILIENT TILE FLOORING

## PART 1 - GENERAL

## 1.1 SUMMARY

A. Section Includes: Solid vinyl tile.

## 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each color and pattern of floor tile required. Sample size no larger than 8.5" x 11".
- C. Maintenance data.

### 1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

### 1.4 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

- 2.1 FLOOR TILE
  - A. Basis of Design: Refer to Finish Legend on Drawings.
  - B. Luxury Vinyl Tile LVT-1:
    - 1. Solid Polymer Core (SPC) Vinyl tile with cork backing.

- 2. Layered plank consisting of wearlayer, film, and backing.
- 3. Form: Planks
- 4. Overall Thickness: 0.315 inch.
- 5. Wearlayer Thickness: .020".
- 6. Sizes: 7" X 48".
- 7. Edge: Accent beveled edge.
- 8. Colors: Refer to Finish Legend on Drawings.
- C. Luxury Vinyl Tile LVT-2:
  - 1. ASTM F1700 Class III Solid Vinyl Tile.
  - 2. Layered plank consisting of wearlayer, film, and backing.
  - 3. Form: Planks.
  - 4. Overall Thickness: 0.120 inch.
  - 5. Wearlayer Thickness: .030" clear, rigid high density PVC.
  - 6. Sizes: 4" X 36".
  - 7. Edge: Square.
  - 8. Colors: Refer to Finish Legend on Drawings.
- D. Resilient and other hard surface flooring must meet the requirements of the FloorScore standard for low-emitting flooring material.

### 2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated. Maximum allowable VOC content is 50 g/L.

# PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions 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. 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.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  - 4. Moisture Testing: Perform tests recommended by floor covering manufacturer and as follows. Proceed with installation only after substrates pass 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. in 24 hours.

- b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
  - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

## 3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles square with room axis.
  - 2. Refer to Finish Legend in Drawings for layout pattern.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Adhere floor 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.

### 3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Cover floor tile until Substantial Completion.

### END OF SECTION 09 65 19
# SECTION 09 68 13 - TILE CARPETING

### PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes modular carpet tile and walk-off mats.

### 1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture specified. Sample size no larger than 8.5" x 11".

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranty.

### 1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

#### 1.6 QUALITY ASSURANCE

A. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

### 1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

#### 1.8 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

### 1.9 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. Carpet Tiles: Furnish extra carpet tile in quantity equal to 5 percent of total material furnished but not less than one unopened box of tile for each type, pattern and color

#### 1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
  - 3. Warranty Period: 10 years from date of Substantial Completion.

# PART 2 - PRODUCTS

# 2.1 CARPET TILE

- A. Basis-of-Design Product: Refer to Finish Legend on Drawings.
- B. Carpet Characteristics:
  - 1. Pile Yarn Content: Staple filament or continuous filament premium branded nylon branded by a major fiber producer; Invista, Solutia, Shaw, and Honeywell.
  - 2. Environments Requirements: Meet "Green Label Plus" requirements.
  - 3. Carpet Pile Construction: Level loop, textured loop, level cut pile, or level cut/uncut pile.
  - 4. Pile Weight: Minimum 20 oz/sqyd for level loop or textured loop construction. Pile weight shall be a minimum weight of 30 oz/sqyd for level cut/uncut construction.
  - 5. Secondary Back: PVC free made from Polyurethane hardback, Thermoplastic Polyolefin Composite, Ethylene Vinyl Acetate EVA, Polyurethane Cushion, or Olefin hardback reinforced with fiberglass.
  - 6. Total Weight: Minimum of 90 oz/square yard
  - 7. Density: Minimum of 5,000 oz/cubic yard
  - 8. Pile Height: 1/8-inch minimum. The combined thickness of the total product shall not exceed 1/2-inch.
  - 9. Static Buildup: Static buildup shall be a maximum of 3.5 kilovolt, when tested in accordance with AATCC 134.
  - 10. Flammability: Meet requirements of ASTM E648 Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
  - 11. Carpet Construction: Minimum of 64 tufts per square inch.
  - 12. Carpet Reclamation: Dispose of any carpet replaced during the life of the lease from the site to a carpet recycling program or participate in a carpet buyback program. When carpet is replaced, submit documentation of carpet reclamation to GSA.

# 2.2 WALK-OFF MAT

A. Refer to Finish Legend on Drawings.

#### 2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives & Sealants: Only use adhesives and sealants in the interior of the building that meet or do not exceed the VOC limits of the current requirements of South Coast Air Quality Management District (SCAQMD) Rule No. 1168. The current requirements are listed in Division 01 Section "LEED Requirements".

### PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Preparation: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- E. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- F. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.
- G. Maintain dye lot integrity. Do not mix dye lots in same area.
- H. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- I. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- J. 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.
- K. Install pattern parallel to walls and borders.
- L. Perform the following operations immediately after installing carpet tile:

- 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
- 2. Remove yarns that protrude from carpet tile surface.
- 3. Vacuum carpet tile using commercial machine with face-beater element.
- M. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 09 68 13

SECTION 09 72 00 - WALL COVERINGS

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Vinyl wall covering.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.
- C. Samples: For each product indicated in the Finish Legend. Sample size no larger than 8.5" x 11".
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.
- E. Maintenance Data: For wall coverings to include in maintenance manuals.

### 1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Surface-Burning Characteristics: As follows, per ASTM E 84:
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 50 or less.

#### 1.4 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.

### PART 2 - PRODUCTS

### 2.1 WALL COVERINGS

A. General: Provide rolls of each type of wall covering from same print run or dye lot.

#### 2.2 VINYL WALL COVERING

- A. Vinyl Wall-Covering Standards: Provide mildew-resistant products complying with the following:
  - 1. CFFA-W-101-D for Type II, Medium-Duty products.
  - 2. Basis of Design Products: Refer to Finish Legend on Drawings.

#### 2.3 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application; as recommended in writing by wall-covering manufacturer and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Primer/Sealer: Mildew resistant, complying with requirements in Division 09 Section "Painting" and recommended in writing by wall-covering manufacturer for intended substrate.
- C. Seam Tape: As recommended in writing by wall-covering manufacturer.

# PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- B. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
  - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
  - 2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
  - 3. Metals: If not factory primed, clean and apply metal as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
  - 4. Gypsum Board: Verify and/or prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
  - 5. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- C. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- D. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

- E. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.
- F. Install strips in same order as cut from roll.
- G. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
- H. Match pattern 72 inches above the finish floor.
- I. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.
- J. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
- K. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.
- L. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- M. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00

# SECTION 09 75 13 - STONE WALL FACING

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Architectural stone veneer.

#### 1.2 SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

### B. Samples:

- 1. For each stone type indicated.
- C. Maintenance Instructions.

#### 1.3 DELIVERY, STORAGE AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

#### 1.4 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.

# PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: Surface Art, Ledger Stone, Carbon Slate.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 25 00 -Substitution Procedures.

### 2.2 STONE VENEER

- A. Veneer Unit Properties: Slate veneer units and accent pieces complying with ASTM C629, Classification I Exterior or II Interior.
  - 1. Units: See Drawings for specific pattern and color.

#### 2.3 RELATED MATERIALS

- A. Bond Coat: Pre-Packaged Cement Mortar: ANSI A118.4T.
- B. Sealer: Water based silane or siloxane masonry sealer, clear.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
  - 1. Examine substrates upon which work will be installed.
  - 2. Commencement of work by installer is acceptance of substrate.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### 3.2 PREPARATION

- A. Protection: Protect adjacent work from contact with mortar.
- B. Clean surfaces thoroughly prior to installation.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

#### 3.3 INSTALLATION

- A. Install per manufacturer's instructions, or TCNA System W243-15, whichever is more stringent.
- B. Install and clean stone in accordance with Jointless/Dry-Stacked installation.
  - 1. Clean stone paneling as work progresses. Remove adhesive smears immediately.
  - 2. Clean stone completely no fewer than six days after installation, using clean water and soft rags or stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone
- C. Apply sealer in accordance with sealer manufacturer's installation instructions.

# 3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

# END OF SECTION 09 75 13

# SECTION 09 91 10 - PAINTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes surface preparation and field painting of exposed items and surfaces.
- B. Related Sections:
  - 1. Division 3 Section "Concrete Finish Sealers" for sealer on interior concrete floor slabs.

### 1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: For each type of finish-coat material indicated.

### 1.3 QUALITY ASSURANCE

- A. Benchmark Samples: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5.
  - 1. Wall Surfaces: Provide samples on at least 100 sq. ft.
  - 2. Small Areas and Items: Architect will designate items or areas required.
  - 3. Final approval of colors will be from benchmark samples.

#### 1.4 PROJECT CONDITIONS

- A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
- B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- 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 above the dew point; or to damp or wet surfaces.

#### PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
  - A. Approved Manufacturer's:
    - 1. Benjamin Moore & Co. (Benjamin Moore).

- 2. Glidden Professional (Glidden).
- 3. Sherwin-Williams Co. (Sherwin-Williams).
- 4. Rodda Paint Co. (Rodda)

### 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, as demonstrated by manufacturer based on testing and field experience.
- 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.
- C. Colors: As indicated on the Finish Key on the Drawings.

### 2.3 ACCESSORY ITEMS

- A. Muriatic acid, mildewcide, TSP (tri-sodium phosphate), acidic-detergent, zinc sulfate, sodium metasilicate, and solvent: Commercially available, non-damaging to surface being cleaned; as specified in PDCA Specification Manual; acceptable to coating manufacturer.
- B. Metal Conditioner: Proprietary phosphoric acid based, etching type solution; acceptable to coating manufacturer.
- C. Rust Inhibitor: Water containing 0.32 percent of sodium nitrite and 1.28 percent by weight of secondary ammonium phosphate (dibasic); or water containing 0.2 percent by weight of chromic acid or sodium chromate or sodium dichromate or potassium dichromate.
- D. Spackling compound, putty, plastic wood filler, liquid de-glosser, latex patching plaster, latex base filler, thinners, and other materials not specifically indicated but required to achieve finishes specified: Pure, of highest commercial quality, compatible with coatings and acceptable to coating manufacturer.
- E. Do not use products of different manufacturers in combination.

# 2.4 PREPARATORY COATS

- A. Interior Metal Primer: Interior latex-based primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
  - 1. Ferrous-Metal Substrates: Quick drying, rust-inhibitive metal primer.
  - 2. Zinc-Coated Metal Substrates: Galvanized metal primer.
  - 3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.
- B. Interior Gypsum Board Primer: Low VOC Latex Primer. Interior latex-based primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated
  - 1. Benjamin Moore and Company: Eco Spec Interior Latex Primer Sealer 231.
  - 2. ICI Paints: Prep & Prime Odor-less Interior Water Based Primer-Sealer No. LM9116.

- 3. Sherwin-Williams: ProGreen 200 Primer B28W600.
- 4. Rodda Paint Co.
  - a. Rodda Paint 507701x Roseal Primer (48.0 g/I VOC)
  - b. Rodda Paint 503501x Horizon Primer (0.0 g/l VOC)
- C. Wood Sanding Sealer (Vinyl Toluene Copolymer):
  - 1. Benjamin Moore and Company: Sanding Sealer Clear No. 253.
  - 2. Glidden Professional: WoodPride Water Based Interior Quick Dry Sanding Sealer No.1916V.
  - 3. PPG Industries, Inc.: Speedhide Alkyd Sanding Sealer, 6-10.

### 2.5 INTERIOR FINISH COATS

- A. Low-VOC Interior Latex/Acrylic Based Paint:
  - 1. Benjamin Moore and Company Eco Spec Interior Latex:
    - a. Flat: 219
    - b. Eggshell: 223
    - c. Semi-Gloss: 224
  - 2. Glidden Professional:
    - a. Flat: Lifemaster No VOC Flat No. GP 9100.
    - b. Eggshell: Lifemaster No VOC Eggshell No. GP 9300.
    - c. Semi-Gloss: Lifemaster No VOC Semi-Gloss No. GP 9200.
  - 3. Sherwin-Williams: Harmony
    - a. Flat: B-11.
    - b. Egg Shell: B9
    - c. Semi-Gloss: B10.
  - 4. Rodda Paint Company.
    - a. Flat:
      - 1) Rodda Paint; 51310xx Master Painter Interior flat finish (49.0 g/l VOC)
      - 2) Rodda Paint; 51350xx Horizon Flat Interior finish (0.0 g/I VOC)
    - b. Eggshell:
      - 1) Rodda Paint; 52310xx Master Painter Interior Satin Finish (93.0 g/I VOC)
      - 2) Rodda Paint; 52350xx Horizon Satin Interior finish (0.0 g/I VOC)
    - c. Semi-gloss:
      - 1) Rodda Paint; 54310xx Master Painter Interior semi-gloss (133 g/I VOC)
      - 2) Rodda Paint; 54350xx Horizon Semi-gloss finish (0.0 g/l VOC)
    - d. Semi-gloss for Interior Metal work.

- 1) Rodda Paint; 54200xx Unique II Semi-Gloss enamel (147.0 g/I VOC)
- 2) Rodda Paint; 54890xx Multi Master DTM Semi-Gloss (140.0 g/l VOC)

### 2.6 WOOD STAINS AND COATINGS

- A. Non-Masking Penetrating Stain:
  - 1. Benjamin Moore and Company: Penetrating Stain Series 241.
  - 2. Sherwin-Williams: Sherwood S64.
  - 3. Rodda Paint; Varathane Water Based interior wiping stain.
- B. Polyurethane Varnish:
  - 1. Benjamin Moore and Company: Benwood Polyurethane Finishes No.424 (Flat), 435 (Satin), and 428 (Gloss).
  - 2. Glidden Professional: Woodpride Water Based Varnish No. 1802 (Satin) and 1808 (Gloss).
  - 3. PPG Industries, Inc.: Rez Polyurethane Varnish No. 77-9 (Satin), 77-5 (Gloss).
  - 4. Pratt and Lambert Specialty Products: Varmor Clear Urethane.
  - 5. Sherwin-Williams: Wood Classics Polyurethane Varnish A67 Series.
  - 6. Rodda Paint; Varathane Diamond Water Based Clear Polyurethane Finish.

### PART 3 - EXECUTION

#### 3.1 APPLICATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
- 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.
- C. 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.
- 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. 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. Wirebrush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
- 3. Gypsum Board:
  - a. Refer to Section 09 29 00 for general surface preparation.
  - b. Fill remaining cracks, depressions, holes and other irregularities with spackling compound.
  - c. Sand rough or high spots left by joint cement or spackling compound without damaging paper face.
  - d. Remove dust by wiping with damp cloths or vacuuming.
  - e. Do not prime gypsum board scheduled to receive wall-covering under Section 09 72 00.
- E. Wood Transparent Finish:
  - 1. Remove excess residue from knots, pitch streaks, cracks, open joints, and sappy spots. Ensure exposed fasteners are countersunk.
  - 2. Sand wood surfaces and edges smooth. Remove dust after each sanding.
  - 3. After stain is dry and before sanding sealers are applied, fill nail holes, cracks, open joints and other defects with putty or plastic wood filler.
  - 4. Tint fillers to match stain and finish coatings. Work fillers well into and perpendicular to grain before set. Wipe excess from surface.
- F. Material Preparation:
  - 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.
- G. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
  - 1. 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.
  - 2. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  - 3. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  - 4. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- H. Sand lightly between each succeeding enamel or varnish coat.
- I. 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. Omit primer over metal surfaces that have been shop primed and touchup painted.
  - 2. 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.

- J. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
- K. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- L. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- M. 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.
- N. 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.
- O. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
- P. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

### 3.2 CLEANING AND PROTECTING

- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
- B. 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.
- C. 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.

# 3.3 INTERIOR PAINT SCHEDULE

- A. Gypsum Board:
  - 1. Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Interior gypsum board primer (unpainted surfaces.
    - b. Finish Coats: Low-luster acrylic enamel at walls and Restroom ceilings; Semi-gloss at Restroom walls.
- B. Ferrous Metal:
  - 1. Acrylic Finish: Two finish coats over a primer.

- a. Primer: Interior ferrous-metal primer.
- b. Finish Coats: Interior semigloss acrylic enamel.
- c. Location: Door frames.

### 3.4 WOOD STAIN SCHEDULE

- A. Natural Finish Wood Substrate:
  - 1. Clear Polyurethane Finish:
    - a. Sheen: Satin.
    - b. Stain: Non-Masking Penetrating Stain.
    - c. Wash Coat: Sanding sealer reduced 1:6.
    - d. Filler: Paste Wood Filler.
    - e. Sealer: Sanding Sealer, sanded.
    - f. Under Coat: Polyurethane Varnish at 1.3 mils.
    - g. Top Coat: Polyurethane Varnish at 1.3 mils.
    - h. Location: Wood doors scheduled to be stained.

END OF SECTION 09 91 10

SECTION 10 14 00 - SIGNAGE

#### PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Interior panel signs.

# 1.2 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
  - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 2. Provide graphic elements for each sign.
- C. Samples: For each sign type and for each color and texture required.

#### 1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.

# PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
- B. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressuresensitive adhesive backing, suitable for exterior applications.

# 2.2 PANEL SIGNS

- A. General: Provide panel signs, including Restroom Signs, that comply with requirements indicated on Drawings for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
  - 1. Include graphics and Braille complying with applicable codes.
  - 2. Subsurface graphics printed on second surface of 0.100 matte (non-glare) acrylic with painted background color, laminated to 1/8- inch acrylic sheet.
  - 3. Corners: 1/2-inch radius.
  - 4. Letter Style: Optima Semi-Bold upper case.
  - 5. Letter Size: 0.75-inch.
  - 6. Symbol Size: 4-inch
  - 7. Finish: Per Architect and ADA requirements.
  - 8. Colors: Black Background with White Text.
  - 9. Braille: Provide raised Braille complying with ADA requirements.
- B. Required Panel Signs:

Room Description	Room Number	Size	Graphic	Text
Restroom	106	7x9	Men/Women/ADA Symbol	RESTROOM
Restroom	119	7x9	Men/Women/ADA Symbol	RESTROOM

- 2.3 ACCESSORIES
  - A. Interior Panel Mounting: Manufacturer's standard two-face tape.

# 2.4 FABRICATION

#### 2.5 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

#### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
  - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
  - 1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

END OF SECTION 10 14 00

# SECTION 10 14 26 - POST AND PANEL/PYLON SIGNAGE

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes nonilluminated posts for Owner supplied parking signs.

### 1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

### PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Steel:
  - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90coating, either commercial or forming steel.
  - 2. Steel Tubing or Pipe: ASTM A 500, Grade B.
  - 3. Steel Members Fabricated from Plate or Bar Stock: ASTM A 529/A 529M or ASTM A 572/A 572M, 42,000-psiminimum yield strength.
  - 4. Bolts for Steel Framing: ASTM A 307 or ASTM A 325as necessary for design loads and connection details.
  - 5. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

### 2.2 POSTS

- A. Steel Posts: Flexible sign post with integrated torsion spring to resist impact. Fabricate from round steel tubing. Include torsion spring base plat, sign bracket, and related accessories required for complete installation. Hot-dip galvanize post assemblies after fabrication to comply with ASTM A 123.
  - 1. Basis of Design: Standard FlexPost, by Flexpost, Inc.
  - 2. Post length: 6 feet.
  - 3. Post Size: 1-5/8-inch round.
  - 4. Post Finish: Galvanized Silver.

#### 2.3 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead

expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete.

### PART 3 - EXECUTION

- 3.1 INSTALLATION
  - A. Baseplate Method:
    - 1. Drilled-in-Place Anchor Bolts: Set post baseplate in position over concrete foundation, locate and drill anchor holes, shim and support post to prevent movement, place washers and anchor bolts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.

END OF SECTION 10 14 26

# SECTION 10 22 39 - FOLDING GLASS-PANEL PARTITIONS

# PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Manually operated, glass-panel partitions.

#### 1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For operable panel partitions.
  - 1. Include plans, elevations, sections, attachment details.
  - 2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Delegated-Design Submittal: For operable panel partitions.
  - 1. Include design calculations for seismic restraints that brace tracks to structure above.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Setting Drawings: For embedded items and cutouts required in other work.
- B. Seismic Qualification Certificates: For operable panel partitions, tracks, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of operable panel partition.
- D. Product test reports.
- E. Sample warranty.

# 1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

### 1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

# PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design seismic bracing of tracks to structure above.
- B. Seismic Performance: Operable glass-panel partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the partition panels will remain in place without separation of any parts when subjected to the seismic forces specified."
- C. Acoustical Performance: Provide operable glass-panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
  - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.

### 2.2 OPERABLE GLASS PANELS

- A. Operable Glass Panels: Aluminum-framed glass-panel partition system, including panels, seals, suspension system, operators, and accessories.
  - 1. Basis of Design: Modernfold, Acousti-Clear Automatic Seal Paired Panel.
- B. Panel Operation: Manually operated, paired panels hinged together in pairs.
- C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
  - 1. Factory-Glazed Fabrication: Glaze operable glass panels in the factory where practical and possible for applications indicated.

- D. Glass and Glazing: As follows:
  - 1. Glass: Manufacturer's standard safety glass and glass assemblies as indicated and complying with the following:
    - a. Thickness: 0.38-inch one side; 0.31-inch on opposite side.
    - b. Tempered Glass: ASTM C1048, Kind FT (fully tempered), Type I (transparent flat glass), Class 1 (clear), Quality-Q3.
- E. Dimensions: Fabricate operable glass-panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
- F. STC: Not less than 45.
- G. Panel Frame Materials:
  - 1. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; manufacturer's standard strengths and thicknesses for type of use.
- H. Panel Closure: Pivot Panel.
  - 1. Hardware: Manufacturer's standard non-locking rail handle.
- I. Hinges: Invisible laminated hinge with antifriction segment mounted between each heat-treated link. Hinge to be attached directly to frame with welded internal hinge bracket providing hinge support and adjustment. Hinge attached to panel edge is not acceptable.
- J. Panel Trim Finish: Clear anodized.

### 2.3 SEALS

- A. Description: Seals that produce operable glass-panel partitions complying with performance requirements and the following:
  - 1. Seals made from materials and in profiles that minimize sound leakage.
  - 2. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable glass-panel partition is extended and closed.
  - 3. Top and bottom horizontal seals shall operate automatically without tools or cranks, extending as panels are positioned.

#### 2.4 SUSPENSION SYSTEMS

- A. Tracks: Extruded aluminum with adjustable steel hanger rods for overhead support, designed for operation, size, and weight of operable glass-panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable glass-panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install operable glass-panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.
- B. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- C. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

### 3.2 ADJUSTING

- A. Adjust glass-panels to operate smoothly and easily, without binding or warping.
- B. Verify that safety devices are properly functioning.

#### 3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

# END OF SECTION 10 22 39

# SECTION 10 26 00 - WALL AND DOOR PROTECTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Impact-resistant wall coverings (FRP).
  - 2. Corner Guards

### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Maintenance data.

## 1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide impact-resistant, plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

# 1.4 DELIVERY, STORAGE, AND HANDLING

A. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg.

# PART 2 - PRODUCTS

## 2.1 IMPACT-RESISTANT WALL COVERINGS MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 1. American Floor Products Co., Inc.
  - 2. ARDEN Architectural Specialties, Inc.
  - 3. Balco, Inc.
  - 4. Construction Specialties, Inc.
  - 5. IPC Door and Wall Protection Systems; Division of InPro Corporation.
  - 6. Korogard Wall Protection Systems; Division of RJF International Corporation.
  - 7. Pawling Corporation.

# 2.2 IMPACT-RESISTANT WALL COVERINGS

- A. Glass Fiber Reinforced Plastic Wall Covering (FRP 1): Embossed, fiber-backed, impact-resistant plastic sheets, chemical and stain resistant.
  - 1. Provide USDA approved, quick cleaning, impact-resistant, moisture resistant glass fiber reinforced plastic (FRP) panels complete with mating clips and batten strips.
  - 2. Material: Chopped fiberglass roving and polyester resin producing hard, durable sanitary surface.
  - 3. Finish: Embossed.
  - 4. Thickness: 0.090 inch.
  - 5. Trim: Manufacturer's standard, matching moldings and trim as required for complete installation.
  - 6. Fire Rating: Class C Flame Spread.
  - 7. Color: As selected by Architect from manufacturer's full color line.
  - 8. Acceptable Products:
    - a. P-100, Marlite.
    - b. Glasbord-P, Kemlite Company, Inc., Channahon, IL.
    - c. Fiber-Lite Panels, Nudo Products, Inc., Springfield, IL.
- B. Accessories: Provide prefabricated, injection-molded end caps and inside and outside corners with concealed splices, cushions, mounting hardware, and other accessories as required.
  - 1. End caps and inside and outside corners shall match plastic cover color and shall be field adjustable for close alignment with snap-on plastic covers.

# 2.3 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated from 1-piece, formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
  - 1. Available Manufacturers:
    - a. American Floor Products Co., Inc.
    - b. ARDEN Architectural Specialties, Inc.
    - c. Balco, Inc.
    - d. Boston Retail Products.
    - e. Construction Specialties, Inc.
    - f. IPC Door and Wall Protection Systems; Division of InPro Corporation.
    - g. Pawling Corporation.
  - 2. Material: Stainless steel, Type 304.
    - a. Thickness: Minimum 0.0500 inch.
    - b. Finish: Directional satin, No. 4.
  - 3. Wing Size: Nominal 1-1/2 by 1-1/2 inches.
  - 4. Corner Radius: 1/4 inch.
  - 5. Height: 4'-0".
  - 6. Mounting: Adhered to surface.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Complete finishing operations, including painting, before installing wall-protection system components.
- B. Install wall-protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- C. Immediately after completion of installation, clean units using a standard, ammonia-based, household cleaning agent.

# END OF SECTION 10 26 00

### SECTION 10 28 13 - TOILET ACCESSORIES

#### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following: Toilet accessories.

### 1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis-of-Design Products: The design for toilet and bath accessories described in Part 2 are based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  - 1. Toilet and Bath Accessories:
    - a. A & J Washroom Accessories, Inc.
    - b. American Specialties, Inc.
    - c. Bobrick Washroom Equipment, Inc.
    - d. Bradley Corporation.
    - e. General Accessory Manufacturing Co. (GAMCO).
    - f. McKinney/Parker Washroom Accessories Corp.

#### 2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- C. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
- E. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of **six** keys to Owner's representative.

# 2.3 TOILET AND BATH ACCESSORIES

- A. Horizontal Grab Bars:
  - 1. Product: Bobrick B-5806
  - 2. Quantity: One at each ADA WC.
- B. Vertical Grab Bars:
  - 1. Product: Bobrick B-5806
  - 2. Quantity: One at each restroom ADA WC.
- C. Restroom Mirror:
  - 1. Product: Bobrick 165 Series, channel frame mounted.
  - 2. Size: 24 inches wide x 36 inches high.
  - 3. Quantity: One at each restroom.
- D. Toilet Tissue Dispenser:
  - 1. Product:Bobrick, B-6977, Recessed.
  - 2. Quantity: One at each restroom.
- E. Temperature Shielding:
  - 1. Product: TrurBro #130, White
  - 2. Quantity: One at each restroom sink.
- F. Towel Dispenser:
  - 1. Product: Bobrick, B-262 Classic Series
  - 2. Quantity: One at each restroom and one in breakroom above sink.
- G. Seat Cover Dispenser:
  - 1. Product: Bobrick, B-221 Classic Series
  - 2. Quantity: One at each WC.
- H. Coat Hooks:
  - 1. Product: Smedbo SME-BN072M 1-1/4"
  - 2. Single hook; back of door at restrooms and at each office
  - 3. Finish: Brushed Nickel.
- I. Mop & Broom Holder:
  - 1. Product: Bobrick B-239 34"
  - 2. Quantity: One above mop sink.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
  - 1. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
- B. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

END OF SECTION 10 28 13

# SECTION 10 31 00 - PRE-MANUFACTURED FIREPLACES

# PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Prefabricated electric fireplaces.
- B. Related Sections
  - 1. Division 9 Section "Non-Structural Metal Framing".

### 1.2 SUBMITTALS

- A. Product Data: Provide manufacturer's standard details and installation instructions.
- B. Shop Drawings: Provide drawing of required clearances, rough-in of enclosure and utilities.
- C. Operation and Maintenance Data: Manufacturer's printed operation and maintenance procedures.

# 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Inspect products upon receipt to ensure products are free from damage occurring in transit.
- B. Store products in covered area, well-protected from weather.

# PART 2 - PRODUCTS

#### 2.1 MANUFACTURED ELECTRIC FIREPLACES

- A. Model: BI-50-SLIM, Amantii Electric Fireplaces
  - 1. Viewing opening: 12-inch x 45 1/4-inch.
  - 2. Dual flame: blue/multi-color.
  - 3. Heater: 1500 W.
  - 4. Media: glass nuggets.
  - 5. Remote Control.
  - 6. Power: 120V, 12.4 amp.
  - 7. Metal Finish: Black.

# PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that dimensions are correct and substrate is in proper condition for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions, ANSI Z21.44 and the requirements of authorities having jurisdiction.
- B. Use manufacturer's guidelines for minimum clearances to combustibles, walls, and finishes.
- C. Anchor all components firmly in position for long life under hard use.

### 3.3 FIELD QUALITY CONTROL

- A. Upon completion of installation, visually inspect all exposed surfaces. Touch up scratches and abrasions with touch-up paint recommended by the manufacturer, make imperfections invisible to the unaided eye from a distance of 5 feet (1.5m).
- B. Test for proper operation, control and safety devices.
- C. Complete Installer's Warranty Validation Card.

#### 3.4 PROTECTION

A. Protect installed products until completion of project.

# END OF SECTION 10 31 00

## SECTION 10 44 00 - FIRE-PROTECTION SPECIALTIES

#### PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Portable fire extinguishers.
  - 2. Fire-protection cabinets.
  - 3. Mounting brackets for fire extinguishers.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. Fire Extinguishers: Include rating and classification.
  - 2. Fire-Protection Cabinets: Include door hardware, cabinet type, trim style, panel style, and details of installation.
- B. Maintenance data.

#### 1.3 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- C. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

#### 1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

#### PART 2 - PRODUCTS

# 2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

- B. Stainless-Steel Sheet: ASTM A 666, Type 304.
- C. Break Glass: Clear float glass, ASTM C 1036, Type I, Class 1, Quality q3, 1.5 mm thick, single strength.

#### 2.2 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
  - 1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-Ibominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
- C. Mounting Brackets: Provide brackets for extinguishers not located in cabinets.

### 2.3 FIRE-PROTECTION CABINET

- A. Basis of Design: Cosmopolitan 1037, JL Industries.
- B. Cabinet Type: Suitable for fire extinguisher.
- C. Cabinet Construction: Nonrated, unless otherwise indicated on Drawing.
- D. Cabinet Material: Stainless-steel sheet.
- E. Semirecessed Cabinet: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
  - 1. Rolled-Edge Trim: 2-1/2-inchckbend depth.
- F. Cabinet Trim Material: Stainless-steel sheet.
- G. Door Material: Stainless-steel sheet.
- H. Door Style: Vertical duo panel with pull handle.
- I. Door Glazing: Tempered glass.
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- K. Accessories:
  - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fireprotection cabinet, with plated or baked-enamel finish.
  - 2. Door Lock: Saf-t-lok.
  - 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

- a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
  - 1) Location: Applied to cabinet door.
  - 2) Application Process: Silk-screened.
  - 3) Lettering Color: As selected by Architect.
  - 4) Orientation: Vertical.
  - 5) Color: Black.
- L. Finishes: Stainless Steel: Bright, directional polish, No. 4.

### 2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth.
  - 1. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-ck, cold-rolled steel sheet lined with minimum 5/8-inch-ck, fire-barrier material. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
  - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick
  - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.
- C. Prepare recesses for fire-protection cabinets as required by type and size of cabinet and trim style.
- D. Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- E. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets.
  - 2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- F. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
G. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair.

END OF SECTION 10 44 00

SECTION 11 31 00 - APPLIANCES

#### PART 1 - GENERAL

#### 1.1 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed finish.
- C. Maintenance data.

#### 1.2 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Residential Appliances: Comply with NAECA standards.

#### PART 2 - PRODUCTS

#### 2.1 APPLIANCES

- A. Dishwasher: Model GE GDT226SSLSS, Stainless, ADA Compliant Built-in, undercounter, automatic dishwasher, listed by UL.
- B. Refrigerator: Model GE GTE19JSNRSS, Energy Star® 19.1 Cu. Ft. Top-Freezer Refrigerator, Stainless. LH door operation.
- C. Undercounter Refrigerator: Model EdgeStar CBR902SGDUAL, 160 can beverage cooler, Stainless.
- D. Microwave: Model GE PEM31SFSS. 1100 watt, Glass turntable, Stainless.
- E. Additional appliances furnished by Owner and installed by Contractor:
  - 1. Coffee Maker: Keurig B150 with water line connection.

### PART 3 - EXECUTION

- 3.1 INSTALLATION, GENERAL
  - A. Provide electrical to Owner Furnished, Owner Installed Equipment.

- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Utilities: Refer to Divisions 23 and 26 for electrical and plumbing requirements.

END OF SECTION 11 31 00

#### SECTION 12 24 13 - ROLLER WINDOW SHADES

#### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes manual roller shades.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, details of installation, operational clearances, and relationship to adjoining Work.
  - 1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
- C. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items.
- D. Samples: For each exposed finish and for each color and texture required.
- E. Window Treatment Schedule: Use same room designations indicated on Drawings.
- F. Maintenance data.

#### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products.
- B. Roller Shades Fire-Test-Response Characteristics: Provide products by a testing agency acceptable to authorities having jurisdiction.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Corded Window Covering Product Standard: Comply with WCMA A 100.1.

#### PART 2 - PRODUCTS

- 2.1 ROLLER SHADES
  - A. Basis of Design: Draper.

- B. Finishes:
  - 1. Valance/Fascia Trim: Color as selected by Architect from manufacturer's full range to match window frame color.
  - 2. Metal and Plastic Components Exposed to View: Color matching or coordinating with shade band color, unless otherwise indicated.
- C. Shade Material:
  - 1. WC-1: Refer to Finish Legend in the Drawings.

#### 2.2 COMPONENTS

- A. Access and Material Requirements:
  - 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
  - 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
  - 3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.
- B. Manual Operated Chain Drive Hardware and Brackets:
  - 1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
  - 2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
  - 3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
  - 4. Provide shade hardware system that allows for operation of multiple shade bands (multibanded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
  - 5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
  - 6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
  - 7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
  - 8. Drive Bracket / Brake Assembly:
    - a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
    - b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
    - c. The brake shall be an over running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
    - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated

brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.

- e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
- C. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.
- D. Bottom Bar: Steel or extruded aluminum and with concealed weight bar as required for smooth, properly balanced shade operation.
  - 1. Type: Concealed, by pocket of shade material, internal.
- E. Fascia: One piece extruded aluminum.
- F. Valance: In style as selected from manufacturer's full range.
- G. Mounting Assembly:
  - 1. Ceiling mounted with "No Cost Pocket" and 2-inch closure and closure mount with tile support.
  - 2. Manufacturer's standard to allow for continuous front or back-roll fascia across multiple shades without exposed fasteners.

#### 2.3 FABRICATION

- A. Product Description: Roller shade consisting of roller, a means of supporting roller, flexible sheet or band of material carried by roller, a means of attaching material to roller, bottom bar, and 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.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
  - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inchtotal, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- 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 under conditions of normal use.

### PART 3 - EXECUTION

#### 3.1 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 to interior face of glass. Allow proper clearances for window operation hardware.
- B. Adjusting: Adjust roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Cleaning: Clean roller shade surfaces after installation, according to manufacturer's written instructions.

#### 3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 1 Section "Closeout Procedures."

#### 3.3 SCHEDULE

A. Install window shades at all exterior windows.

#### END OF SECTION 12 24 13

## SECTION 12 36 23 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

#### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes plastic-laminate countertops.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including high-pressure decorative laminate.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
  - 1. Plastic laminates, for each color, pattern, and surface finish.

### 1.3 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops 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.

#### PART 2 - PRODUCTS

#### 2.1 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS or Grade HGP.
- D. Colors, Patterns, and Finishes: Refer to Drawings for product selection.
- E. Edge Treatment:
  - 1. 0.5 mm PVC banding at solid patterns.
  - 2. 1.0 mm PVC banding at wood grain patterns.
  - 3. 3.0 mm PVC banding at high impact locations.
  - 4. Match laminate in color, pattern, and finish.
- F. Core Material at Sinks: Particleboard made with exterior glue or medium-density fiberboard made with exterior glue.

#### G. Core Thickness: 3/4 inch.

1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

#### 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
  - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
  - 2. Particleboard: ANSI A208.1, Grade M-2 or Grade M-2-Exterior Glue.
  - 3. Softwood Plywood: DOC PS 1.

#### 2.3 FABRICATION

- A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets.
- B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
  - 1. Seal edges of openings in countertops with a coat of varnish.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

#### 3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

- 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
- 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required.
  - 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
  - 1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
  - 3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

END OF SECTION 12 36 23

### SECTION 12 36 69 – QUARTZ AGGLOMERATE COUNTERTOPS

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Quartz agglomerate countertops.

#### 1.2 SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edges, methods of joining, and cutouts for plumbing fixtures.
- C. Samples: For each type of material exposed to view.

#### PART 2 - PRODUCTS

- A. Quartz Countertop Composition: 93 percent crushed quartz aggregate combined with resins and pigments and fabricated into slabs using a vacuum vibro-compaction process.
  - 1. Material certified by NSF International for food and water contact.
  - 2. Identification: Label material with batch number and imprint on back with manufacturer's identifying mark.
  - 3. Color: Refer to Finish Legend on Drawings
- B. Physical Properties:
  - 1. Flexural Strength: 7,400 psi min, ASTM C880.
  - 2. Absorption: Less than 0.02 percent, ASTM C97
  - 3. Mohs Hardness: 6.5-7.5; scratch test.
  - 4. Stain and Acid Resistance: Not affected; ASTM D2299.
  - 5. Wear Resistance: 36.12 gram average; ASTM C501, tested with 1 kg. load, 1000 cycles at 70 rpm.
  - 6. Surface Burning: Flame Spread 10; Smoke Density 195; ASTM E84.
  - 7. Thermal Shock Resistance: Passes 5 cycles, 75 295 degrees F; ASTM C484.

### 2.2 ACCESSORIES

- A. Adhesives & Sealants: Type recommended by manufacturer.
- B. Mastic: Type recommended by manufacturer.
- C. Seam Adhesive: Type recommended by manufacturer; color to blend with sheet material.

- D. Sealants: Type recommended by manufacturer.
- E. Solvent: As recommended by adhesive manufacturer to clean surface of quartz surfacing to assure adhesion of adhesives and sealants.

#### 2.3 COUNTERTOP FABRICATION

- A. General: Assemble work at shop and deliver to project ready for installation. Fabricated in largest practical lengths with seams in least conspicuous locations.
  - 1. Countertops:
    - a. Molded countertop of solid polymer material.
    - b. Provide edge details as indicated on Architectural Drawings.
  - 2. Fabricate work square and to required lines.
  - 3. Recess and conceal fasteners, connections, and reinforcing.
  - 4. Design construction and installation details to allow for expansion and contraction of materials. Properly frame material with tight, hairline joints held rigidly in place.
  - 5. Comply with adhesive manufacturer's recommendations for adhesive shelf life, pot life, working life, mixing, spreading, assembly time, time under pressure and ambient temperature.
  - 6. Fabricate items to profiles shown with connections and supports as detailed or as required for proper installation per manufacturer's recommendations.
  - 7. Provide cut-outs for plumbing fixtures and trim, washroom accessories, appliances, and related items. Confirm lay-out with manufacturer's cut-outs templates before beginning work. Round corners of cut-outs and sand edges smooth.
  - 8. Polish edges and returns that will be exposed to view or food contact.
  - 9. Do not exceed manufacturer's recommended unsupported overhang distances.
- B. Fabricate quartz countertop to following thicknesses; unless indicated otherwise:
  - 1. Countertop: 1.5-inch.

#### PART 3 - EXECUTION

#### 3.1 INSTALLATION

A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

END OF SECTION 12 36 69

## SECTION 21 00 00 GENERAL REQUIREMENTS FOR FIRE SUPPRESSION

### PART 1 GENERAL

### 1.1 APPLICABLE REQUIREMENTS

A. All work to be furnished and installed under this section shall comply with Division 01 – General Requirements.

## 1.2 REFERENCE STANDARDS

- A. ASME BPVC-IX Boiler and Pressure Vessel Code, Section IX Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators 2017.
- B. ASTM A536 Standard Specification for Ductile Iron Castings 1984 (Reapproved 2014).
- C. AWWA C606 Grooved and Shouldered Joints 2015.
- D. NFPA 13 Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

## 1.3 DEFINITIONS

- A. Pipe sizes used in this Section are nominal pipe size (NPS) specified in inches.
- B. Working plans as used in this Section refer to documents (including drawings and calculations) prepared pursuant to requirements in NFPA 13 for obtaining approval of authority having jurisdiction.
- C. NICET National Institute for Certification in Engineering Technologies
- D. Other definitions for fire protection systems are included in referenced NFPA standards.

## 1.4 DESCRIPTION OF WORK

- A. The work includes the design and construction of a complete and fully operable automatic sprinkler system as described in this Section of the Specification and as shown on the contract construction drawings and shall be in accordance with rules, regulations and standards as required by the following authorities having jurisdiction.
  - 1. State of Oregon.
  - 2. City of Bend.
  - 3. Building Department.
  - 4. Fire Prevention Division, Fire Marshal's Office.
- B. Work to be in accordance with criteria of the following design and installation standards:
  - 1. National Fire Protection Association.
    - a. No. 13 Sprinkler Systems
    - b. No. 14 Standpipes & Hose Systems.
    - c. No. 70 National Electrical Code.
    - d. No. 101-Life Safety Code.

- 2. Underwriters Laboratories, Inc.
- 3. Industrial Risk Insurance Underwriters.
- 4. Owner's insurance agency.
- C. Work includes but is not limited to the following:
  - 1. Modification of existing system to provide coverage for Tennant Imporvement. After demolition all surfaces shall be repaired to match original and adjacent surfaces.
  - 2. Repair any damage to the building, premises, and equipment occasioned by the work under this Section.
  - 3. Repair all damage to any part of the building or premises caused by leaks or breaks in pipe, or malfunctions of equipment furnished or installed under this Section until the warranty period expiration date.
  - 4. Where cutting of paving, walls, ceilings, etc. is necessary for the installation of the mechanical work, it shall be done under the direction of this Section. Damage caused by this cutting shall be repaired to match original and adjacent surfaces without additional expense to the Owner. Cutting of new construction shall be by the installing Contractor of that construction as directed by this Contractor
  - 5. Modification to existing Wet Type Sprinkler System.
  - 6. Provide all pipe, fittings, sprinklers, valves, signs, flow switches, tamper switches, protective painting, test connections, drains and tests necessary to make the entire system complete and operative.
  - 7. Valve tags and instruction plates shall be mounted and/or hung per local fire department requirements.
  - 8. All sleeves and inserts.

#### 1.5 SUBMITTALS

- A. Product Data: Submit electronic PDF copy of manufacturer's technical data and installation instructions for fire protection materials and products.
  - 1. Ten days after the awarding of contract, contractor shall submit list of manufacturer's names and model numbers for review and comment to architect. This list shall identify any prior approved substituted items contractor wishes to use. Do not submit technical data until list has been approved. This is mandatory.
  - 2. Prior to construction submit for review and comment items including but not be limited to the following:
    - a. Coordinated layout drawings. Lettering shall be minimum 1/8" high.
    - b. Sprinklers and escutcheons designating area of use.
    - c. Valves, valve boxes, flow switches, and tamper switches.
    - d. Provide State Fire Marshal approval numbers for flow switches and tamper switches.
    - e. Pipe, fittings, sway bracing, inserts, anchors and hangers.
    - f. Inspector's test and drain station.

- g. Fire department connections.
- B. Working Plans: Prepare scaled working plans for fire protection pipe and fittings including, but not necessarily limited to, pipe and tube sizes, locations, and elevations and slopes of horizontal runs, wall and floor penetrations, and connections. Indicate interface between and spatial relationship to piping and adjacent equipment. Lettering shall be minimum 1/8" high. <<All design work shall be done under supervision of licensed engineer. >>
  - Spacing of fire sprinklers shall be coordinated with lights, air conditioning outlets, sound speakers, architectural reflected ceiling plan; obstruction from light fixtures and other architectural features; and sprinkler piping shall be coordinated with HVAC ductwork & piping, plumbing, electrical conduit, cable trays and structure prior to the installation. Drawings shall be composite type including mechanical, plumbing and lighting equipment with sprinkler and sprinkler drain piping.
- C. Submittal Drawings: Submit shop drawings to Agency having jurisdiction for approval bearing engineer of record stamp bearing preparer's NICET stamp. Submit six approved copies, bearing stamp and/or signature of authority having jurisdiction to the Engineer for review and comment.
  - 1. Contractor shall submit sprinkler head locations to architect for approval.
  - 2. Each calculation shall include legible schematic of system showing all hydraulic reference points.
- D. Hydraulic Calculations: Prepare hydraulic calculations of fire protection systems. Submit to authority having jurisdiction for approval. Submit six approved copies, bearing stamp, and/or signature of Agency having jurisdiction to Owner's representative for review and comment.
  - 1. Contractor shall submit published piping friction loss data from manufacturer with hydraulic calculations.
- E. Certificate of Installation: Submit certificate upon completion of fire protection piping work, which indicates that work has been tested in accordance with NFPA 13, and also that system is operational, complete, and has no defects.
- F. Maintenance Data: Submit maintenance data and parts lists for fire protection materials and products. Include this data, product data, shop drawings, approval drawings, approval calculation, certificate of installation, and record drawings in maintenance manual; in accordance with requirements of the General Conditions and of Division 01.
- G. Operating and Maintenance Instructions: Provide the Owner with one set of operating and maintenance instructions covering completely the operation and maintenance of sprinkler equipment and controls.

## 1.6 **DESIGN DESCRIPTION**

- A. This section of the specification combined with any of the contract drawings are intended as a guide to establish a basis of design for the systems required.
- B. Contractor shall examine the record drawings, layout and install a completely hydraulically sized sprinkler system for all areas. Space shall be provided for any valving and equipment to be used.
  - 1. System shall start at the relocated fire main/riser location (see fire protection drawings and

civil drawings showing new fire supply) and extend throughout the building.

- C. The building shall be served with a wet type sprinkler system. A main riser shall be located in the printing shop.
- D. Pressure restricting devices shall be installed on any branch outlet exceeding 100 PSI.
- E. All electrical devices used for this system shall be compatible with any existing fire alarm system, refer to Division 26.
- F. Add Alternate: Contractor shall include a fire pump if required to meet high piled storage requirements, including design and all associated components necessary for a fully operational system.
- G. See drawings for Basis of Design notes.

### 1.7 HYDRAULIC DESIGN

- A. System shall be a straight line or gridded system per NFPA No. 13.
- B. Total Combined Inside & Outside Hose Allowances: Hydraulic calculations shall include an allowance for hose streams, added at the point of connection to the water supply.
- C. Safety Factor: 10 Psi, or 10 percent of static and residual pressure, whichever is greater.
- D. Light Hazard Areas: Water density of 0.10 GPM per square foot calculated for an area of 1500 square feet in the most remote location.
- E. Ordinary Group I Hazard Areas: Water density of 0.15 GPM per square foot calculated for an area of 1500 square feet in the most remote locations.
- F. Ordinary Group II Hazard Areas: Water density of 0.20 GPM per square foot calculated for an area of 1500 square feet in the most remote locations.
- G. Head spacing shall not exceed the limits described in NFPA Pamphlet No. 13.
  - 1. Light Hazard: 225 sq. (for smooth ceiling).
  - 2. Ordinary Hazard: 130 sq. ft.
- H. Maximum floor areas protected by any one sprinkler system riser:
  - 1. Light Hazard: 52,000 sq. ft.
  - 2. Ordinary Hazard: 52,000 sq. ft.
- I. Flow Data: Contractor is to verify flow data (static pressure, residual pressure and GPM flowing) available at site and provide design for available pressure and flow.

### 1.8 QUALITY ASSURANCE

- A. The Contractor for the fire protection installation shall be duly qualified Fire Protection Contractor, experienced and regularly engaged in the installation of fire protection systems with a license classification of C-16. Where local authorities require additional licensing of the Fire Protection Contractor, and/or workmen, such a license shall be mandatory for a prospective Contractor.
  - 1. Contractor is to verify flow data (static pressure, residual pressure and GPM flowing) available at site and provide design for available pressure and flow.

- 2. Contractor is to verify current storage heights for high piled storage areas.
- Contractor is to verify Commodity Type III. Contractor is to inform Owner of any changes that shall be made to storage procedures to meet requirements for Commodity Type III.
- 4. The Fire Protection contractor shall be the Engineer of Record for the automatic sprinkler system.
- 5. Permits The Fire Protection Contractor shall obtain permits for the installation or construction as required for approval and installation of the fire protection system. The Fire Protection Contractor shall submit working plans to the authorities having jurisdiction to obtain approval.

## 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01. Handle components carefully to prevent damage, denting, and scoring. Do not install damaged components. Damaged components shall be replaced with new components.
- B. Store/protect products under provisions of Division 01. Store components in clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage.

## 1.11 GUARANTEE

A. Provide a one-year (12 months) guarantee under provisions of Division 01. The guarantee shall include parts, shipping, labor, travel costs, living expenses, required fees, and any other associated cost or expense to repair or replace products or systems. The guarantee period is to begin on the date of acceptance of the fire protection installation by the Owner.

# PART 2 PRODUCTS

## 2.1 GENERAL

- A. All products to be commercial grade, new and of the manufacturer's latest design model. Products manufacturers outside of North America will not be accepted without written approval from engineer prior to submission of bid.
- B. All products to be UL listed and/or FM approved, except for items, which are not required to be listed by code.
- C. All products shall be delivered and stored in original containers. Containers shall be clearly marked or stamped with manufacturer's name and rating.
- D. The following items to be included:
  - 1. Hangers and supports.
  - 2. Escutcheons plates, flashings and sleeves.
  - 3. Access panel and doors.
  - 4. Identification markers and signs.
  - 5. Expansion compensators and flexible connectors.
  - 6. Anchors, and seismic restraints.
  - 7. Excavation and backfill.

### 2.2 FIRE PROTECTION SYSTEMS

- A. Sprinkler Systems: Comply with NFPA 13.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

#### 2.3 ABOVE GROUND PIPING

- A. General: The piping products listed below by manufacturer's name and model numbers are the only acceptable materials listed for this project. Substitutions of pipe must be submitted and approved in writing by the architect prior to bid. No copper pipe shall be allowed in the wet fire sprinkler system.
- B. Allied Tube & Conduit: Schedule 40 black steel, ASTM A-135 stamped on pipe, UV cured acrylic finish; Stockham, Grinnell or Warwick Class 150 threaded malleable, ASTM A197, ASTM A126, or Victaulic roll-grooved fittings and couplings, only.
- C. Allied Tube: Scheduled 10 black steel pipes, ASTM A-135 stamped on pipe, UV cured acrylic finish; Victaulic roll-grooved fittings and couplings.
- D. Shop-weld thread-o-lets may be used in lieu of tee fittings, but field (site) welding will not be permitted.
- E. Mechanical Couplings: Victaulic grooved couplings style 07, 75 or 77, or equal by Gruvlok.
- F. Mechanical Tees: Victaulic style 920, Gruvlok. U-bolt mechanical tees are not acceptable.
- G. Flexible sprinkler connector for ductwork sprinkler application: Flex head or equal Factory Mutual approved system.
- H. Use rigid couplings where flexibility is not required or provide necessary sway bracing.
- Prohibited Piping and Fittings: Copper pipe, CPVC pipe, pipe less than schedule 40 for threaded or less than schedule 10 for roll grooving; Super 40 "Dyna-Flow", "Dyna- Thread", "Fire flow", XL, Thin wall, "Eddylite" by Bull moose and Threadable Light wall pipe are not allowed. POZ-LOK, U-bolt Victaulic style 921 mechanical tees, Victaulic style 99 Roust-A-Bout, Victaulic style 90 Plain lock, Hooker style fitting, quick disconnect, boltless, snap-joint, field drilling or welding of any main or branch lines, and any device specifically prohibited by the local authority having jurisdiction is not allowed. No unions shall be permitted for any size pipe. Plain end fittings are not allowed.

#### 2.4 RODS AND CLAMPS

- A. Socket clamps shall be stainless steel; four bolt type, equipped with stainless steel socket clamp washers and nuts Grinnell Fig. 595 and 594, Elcen Fig. 37 and 37X, or equal.
- B. Rods shall be stainless steel, 3/4" diameter.

#### 2.5 SPRINKLER HEADS – GENERAL

- A. Sprinkler heads shall be regular automatic closed-type heads of ordinary degree temperature rating except that sprinkler heads installed in the vicinity of heating equipment or in special occupancy areas shall be of the temperature rating as described in NFPA No. 13.
- B. Provide quick response heads in all new light hazard occupancies.
- C. Provide corrosion-resistant sprinkler heads where they are exposed to weather, moisture or corrosive vapors.

- D. Provide sprinkler heads designed for minimum 50 year life span.
- E. The Contractor shall furnish spare heads. The heads shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each type and temperature rating head installed. In addition to the spare heads, the contractor shall furnish not less than two special sprinkler head wrenches. Refer to NFPA 13 section; "Stock of Spare Heads".

### 2.6 SPRINKLER HEADS AND ESCUTCHONS

- A. Sprinkler heads installed shall be upright or pendent, as conditions require, and shall be of the following type and finish for the areas designated. Unless otherwise specified, sprinklers shall be small frame type, center bulb capsule for finished areas, fusible link for unfinished areas, and ½" orifice. Extended coverage sprinkler heads are not allowed.
- B. Manufacturer: Reliable, Star or Viking.

## 2.7 VALVING

- A. 2" or Smaller:
  - 1. Control Valve: OS&Y rising stem type gate valve bronze body, bonnet and disc, copper alloy stem, threaded ends, 175 PSI WOG min. provide with tamper switch.
  - 2. Check Valve: Swing check type with bronze body, cap and disc, threaded ends, 175 PSI WOG min.
  - 3. Drip Valve: 3/4", cast brass automatic ball drip type, threaded ends, 175 PSI WOG min.
  - 4. Testing Valve: 1-1/4", test and drain, sight glass, ½" test orifice, lever operated, 300 psi WOG. Drain to mop sink or drain riser.
  - 5. Main Drain Valve: 2", angle gate valve, bronze body, copper alloy stem, threaded ends, 175 psi WOG. Drain to mop sink or drain riser.
- B. 2-1/2" or Larger:
  - 1. Control Valve: Lug type wafer valve with tamper switch, ductile iron body, nickel plated ductile iron disc, stainless steel stem and Buna-N seat, 175 PSI WOG min.
  - 2. Control Valve: OS&Y rising stem type gate valve, cast iron body and bonnet, bronze stem, seat and disc, flanged ends, 175 PSI WOG min. Provide with tamper switch.
  - 3. Check Valve: Swing check type with cast iron body, bolted cap and disc, flanged ends, 175 PSI WOG min.
  - 4. Manufacturer: Belimo.

#### 2.8 WET SPRINKLER ALARM CHECK VALVE

A. Contractor shall provide, where required, a completely engineered horizontal wet alarm check valve, retarding chamber, and trim assembly.

### 2.9 PRESSURE REDUCING VALVES

A. Sprinkler System: Rough bronze body with red enameled hand wheel with integral check valve of the pressure reducing type. Outlet pressure shall not exceed 165 PSI at maximum system pressures. Pressure settings to be field adjustable.

- 1. 1. Manufacturer: Zurn #Z-3004
- B. Fire Service: 150 class pressure rating, cast iron body with brass main valve trim, control system cast bronze with stainless steel trim
  - 1. 1. Manufacturer: Cla-Val #90-21UL

### 2.10 PRESSURE RELIEF VALVE

- A. Provide 3/4" pressure relief valve on discharge side of Sprinkler system pressure reducing valve. Set to a maximum of 175 PSI.
  - 1. 1. Manufacturer: Zurn #P1000A.

### 2.11 BACKFLOW PREVENTER

- A. Provide listed backflow prevention device as required by local codes and ordinances. Backflow prevention devices installed in the vertical position shall be approved for that orientation.
- B. Double check detector check valve assembly: Epoxy coated, ductile iron construction, 175 Psig working pressure, complete with two spring loaded "Y" type check valves, "Y" strainer with hose bib on suction side of assembly, two OS&Y gate valves, test cocks, bypass water meter and bypass double-check. Watts #709-DCDA-OSY or Wilkins #950DA.
- C. Reduced pressure backflow preventer: Ductile iron construction, 150 Psig working pressure, complete with two spring loaded "Y" type check valves, "Y" strainer with hose bib on suction side of assembly, one differential relief valve, two OS&Y gate valves and test cocks. Unit shall be tapped on both sides to accommodate installation of test cocks. Wilkins #975DA or Watts's #909-RPDA.
- D. Detector check valve assemblies: Ductile iron construction, 150 psig working pressure, complete with spring loaded check valve, two OS&Y gate valves and four test cocks. Febco #800 or approved equal.

## 2.12 INTEGRAL INSPECTORS ALARM TEST AND SYSTEM DRAIN

- A. Combination system drain and visible orifice insert/sight glass for testing system alarm; with screwed or grooved inlet and outlet connections, Malleable iron hand wheel, EPDM valve seats, maximum working pressure 300 Psi, 1/2" orifice insert, Bronze housing, UL listed and FM Approved. Victaulic Test Master II style 720, or approved equal.
- B. Water pressure gauge, range 0-300 Psi, in 5 Psi increments, brass case 3-1/2" diameter, 1/4" NPT male pipe connection, UL listed. Locate pressure gage on riser per code. Star Sprinkler, Ashcroft or approved equal.
- C. Pressure gauge test valve, brass 1/4" screwed ends, 300 Psi WOG. United or approved equal.
- D. All relief, main, auxiliary and equipment drains shall be routed separately to floor drain or air gap fitting.

## 2.13 TAMPER SWITCHES

A. Switch shall be mounted so as not to interfere with normal operation of the valve and be adjusted to operate when handle of valve has traveled more than one-fifth the distance of its normal operating position. Provide conduit from switch to fire alarm panel.

- B. Housing shall be of aluminum, acid-treated, primed and finished in baked red enamel. Removal of housing shall cause switch to operate. Inside shall be single pole, double throw micro switch with connection for electrical conduit.
- C. Install on all control valves.
- D. Manufacturer: Potter-Electric, Notifier, Ellenco, or Simplex.

# 2.14 WATER FLOW ALARM – VANE TYPE

- A. Indicator shall be for either vertical or horizontal installation. Indicator shall not be installed in a fitting that changes direction of water flow and shall have a sensitivity setting to signal any flow of water that equals or exceeds the discharge from one sprinkler head. Provide retarding device to prevent false alarms from line surges.
- B. Whenever a water flow alarm is installed in the piping system, an approved floor control valve shall be provided upstream of the alarm indicator. In addition, a drain is required downstream of the alarm indicator.
- C. Each water flow alarm shall be wired to a Fire System. All wiring and conduits as required will be provided under Division 26. An alarm will automatically activate the local fire alarm system.
- D. Manufacturer: Potter-Electric, Ellenco, Notifier, or Simplex.

# 2.15 EXTERIOR ALARM

- A. Electric bell, 10" diameter, U.L. listed, weather-proof back box housing, 120 VAC, 99 dB at 10 FT; Potter model PBA12010 or equal.
- B. Electric Horn: Potter-Electric, Ellenco, Notifier, or Simplex weatherproof, 120 VAC.

## 2.16 FIRE DEPARTMENT CONNECTIONS

A. Flush wall mounted unit or freestanding unit with individual clapper valves, plugs and chains, locations as indicated on drawings. Escutcheon plate to be lettered as follows; "AUTO SPRINKLER". Unit shall be polished chrome or brass finish, mounted 36" above finished grade. Number of inlets required shall be in accordance with regulations of the Fire Marshal or local fire department.

## 2.17 FIRE DEPARTMENT HOSE VALVES

- A. Fire Department Valves: 2-1/2" brass construction female to male angle valve with cap and chain, rough chrome finish and mounted 48" above finished floor.
- B. Pressure Reducing Fire Department Valves: 2-1/2" tamper proof, automatic pressure reducing, all brass male to female angle, rated at 400 PSI rough brass finish, mounted 48" above finished floor.
- C. Manufacturer: Croker, Elkhart, Powhattan Brass, Potter-Roemer or Zurn.

## 2.18 POST INDICATOR VALVE

A. Indicator post valve and indicator post. Clow # 2925 or approved equal.

## 2.19 MECHANICAL COUPLINGS

- A. Rigid Mechanical Couplings for Grooved Joints:
  - 1. Dimensions and Testing: Comply with AWWA C606.

- 2. Minimum Working Pressure: 300 psig (2065 kPa).
- 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
- 4. Housing Coating: Factory applied orange enamel.
- 5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
- 6. Bolts and Nuts: Hot dipped galvanized or zinc electroplated steel.

### **PART 3 EXECUTION**

### 3.1 GENERAL

A. This system to be installed by an experienced firm regularly engaged in the installation of automatic sprinkler system as specified by the requirements of the Specifications.

### 3.2 PERFORMANCE OF WORK

- A. Examine areas and conditions under which materials are to be installed. Layout the system to suit the different types of construction and equipment as indicated on the drawings and in accordance with NFPA Pamphlet No. 13, 14, 20 and 24.
- B. Work to start immediately after authorization has been given to proceed so that the overall progress of the construction is not delayed.
- C. Coordinate with other trades as necessary to properly interface components of the sprinkler system.
- D. Follow manufacturer's directions and recommendations in all cases.
- E. The omission from the drawings or Specifications of any details of construction, installation, materials, or essential specialties shall not relieve the Contractor from furnishing the same in place for a complete system.

## 3.3 TEMPORARY FIRE PROTECTION

A. Provide all temporary valving, piping, Siamese connections and other components as directed by the fire agency office during all phases of construction.

## 3.4 INSTALLATION GENERAL

- A. Fire protection system shall be installed in accordance with the approved Drawings. Sprinkler heads located in electrical equipment or similar rooms shall be furnished with deflectors to prevent water spray on equipment.
- B. Before connection to the overhead piping, all underground piping shall be flushed with water flowing at velocity and quantity required by the installation standards specified above in this Section of the Specifications.
- C. The arrangement of all pipes shall conform to all architectural requirements and field conditions, shall be as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and shall be neatly spaced. Offsets will be permitted only where required to permit the pipes to follow the walls. Standard fittings shall be used for offsets. All risers shall be erected plumb and true, shall be parallel with the walls and other pipes, and shall be neatly spaced. All work shall be coordinated with existing conditions in

order to avoid interference and unnecessary cutting of floors or walls. Concealed work shall be inspected before the construction is closed up.

- D. Sprinkler heads in all finished areas are to be installed on a true axis line in both directions, with maximum deviation from the axis line of 1 inch plus or minus and shall be plus or minus 1" within center of tile. At the completion of the installation, if any heads are found to exceed the above-mentioned tolerance, they shall be removed and reinstalled.
- E. No pipes or other apparatus shall be installed so as to interfere in any way with full swing of doors.
- F. The arrangement, positions, and connections of pipes, drains, valves, etc., shall be as required by NFPA Pamphlet #13 for all areas to be sprinklered. However, the right is reserved by the Architect to change the location of any item to accommodate conditions, which may arise during progress of the work, without additional compensation for such changes provided that no additional heads are required prior to the installation of the work.
- G. Where required, piping shall be installed concealed in building construction, or though steel beams, to obtain adequate head room.
- H. All pipes throughout the job shall be reamed smooth before being installed. Pipe shall not be split, bent, flattened, or otherwise injured either before or during installation.
- I. Provide protective pans under pipes passing over high voltage electrical bus duct or switchgear equipment. The pan shall be constructed of 12 gauge black iron with a 6 inch lip, the corners being welded to make the pans watertight. Each pan shall be given three coats of Rust-Oleum paint and shall be supported by pipe hangers. The pan shall drain clear of the bus duct or switchgear.
- J. All pipe interiors shall be thoroughly cleaned of foreign matter before installation, and shall be kept clean during installation by plugging or other approved means. Piping shall be covered with visqueen during storage. Piping that shows signs of rusting will be removed from job site and replaced.
- K. Field Connections: Any modifications to system required by field conditions, physical equipment changes or compliance with code regulations shall be made promptly without cost to Owner.
- L. Interference: No piping or sprinkler devices shall interfere with the operations of any door, window or mechanical and electrical systems. No part of this system shall visibly be installed in the physical parameter of any window. Sprinkler mains and branch piping shall not interfere with light fixtures and HVAC diffusers.
- M. Threaded Pipe: Threads shall be clean cut, standard and tapered. Threads shall be made up using flaked graphite and lubricating oil, piping compound or Teflon tape applied to the male threads only.
- N. Grooved Pipe: Installation shall be as prescribed in the Victaulic Piping Manual only. Holes in the piping are to be made in the fabrication shop, not at the job site. Contractor shall provide at the project site a sample of each type of coupling (threaded, standard grooved coupling and mechanical type), showing complete assembly with pipe connections.
- O. Keep all pipe and other openings closed to prevent entry of foreign matter. Cover all equipment and apparatus to protect against dirt, water, chemical or mechanical damage,

before and during construction period. Restore to original condition all apparatus and equipment damaged prior to final acceptance, including restoration of damaged shop coats of paint.

- P. Location of sprinkler piping is critical.
  - 1. Include in base bid (1) two-hour coordination meetings with Owner, Architect, and Engineer for coordination of sprinkler pipe routing.
  - 2. Coordinate beam and shear wall penetrations with Structural Engineer. Obtain written approval for all beam penetrations from Structural Engineer.
- Q. Tracer wire shall be wrapped and taped to non-metallic underground piping at maximum 20 foot intervals.

### 3.5 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 (15 mm) space between finished covering and adjacent work.
  - 2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
  - 3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- I. 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.
- J. 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.
- K. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

## 3.6 SLEEVES AND FLASHING

- A. Wherever pipes are exposed and pass through walls, floors, partitions or ceilings, they shall be fitted with chromium plated steel escutcheons held in place with setscrews. Care shall be taken to protect the escutcheons during the course of construction.
- B. Penetrations through fire rated walls and floors shall be sealed with listed mastic of similar fire rating.

## 3.7 HANGERS INSERTS, SUPPORTS, AND SWAY BRACING

- A. Hangers and supports shall be installed per NFPA #13 sections on Hangers and Protection of Piping against Damage Where Subject to Earthquake. Provide restraint from movement at end sprinkler on branch line per NFPA 13.
- B. Bending of threaded hanger rod is not allowed. All powder driven anchor pins in concrete are not allowed.

## 3.8 SAFETY TESTING & VERIFICATION

- A. Flush, test, and inspect sprinkler piping systems according to NFPA 13 Chapter "System Acceptance."
- B. Provide NFPA 13 Contractor's Material & Test Certificate Form 85A for above ground piping and Form 85B for underground piping.
- C. Provide manpower to test the function and performance of all Life Safety System components and devices per floor and per zone basis in accordance with the local requirements.

## 3.9 IDENTIFICATION

- A. Provide pipe markers every 20 feet, once in every room, and at each building level traversed, minimum.
- B. Provide hydraulic design data nameplates on the riser of each sprinkler system in accordance with NFPA 13

C. Equipment such as valves, drains, etc., shall be provided with signs that identify type of equipment and service. The tag shall be securely fastened to the handle or spindle of the valve by a brass chain. Furnish four schedules of valves so tagged. There shall also be furnished four diagrammatic charts showing schematically the complete sprinkler system with major control valves and numbers thereof. One set of Schedules and charts shall be mounted in glazed frames located where directed.

## 3.10 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

## 3.11 AS-BUILT RECORD DRAWINGS AND CERTIFICATION

- A. As-built Record Drawings are to be kept up-to-date and the Master Copy kept at the job site. Prior to final acceptance of work being approved, these drawings are to be turned over to the Owner's Representative for approval.
- B. Written certification from the insuring agents, and authorities having jurisdiction that the tests were satisfactory.
- C. Contractor is responsible for entering the completion test into the City of Bend Fire Department Compliance Engine.
- D. After installation is complete and tests satisfactorily approved, deliver test certificates and approval by the local Fire Authorities and the FMA to the architect. Final acceptance of sprinkler/standpipe system by Owner's Representative shall be contingent upon receipt of certificate and approval from authorities having jurisdiction and for the delivery of final As-Built Drawings.

## END OF SECTION 21 00 00

# SECTION 21 05 48 VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

### PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Seismic control requirements.
  - 1. Includes requirements for seismic qualification of equipment not specified in this section.

## 1.2 **DEFINITIONS**

- A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g. piping).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

## 1.3 REFERENCE STANDARDS

- A. ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASHRAE (HVACA) ASHRAE Handbook HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.
- C. FEMA 412 Installing Seismic Restraints for Mechanical Equipment 2002.
- D. FEMA 413 Installing Seismic Restraints for Electrical Equipment 2004.
- E. FEMA 414 Installing Seismic Restraints for Duct and Pipe 2004.
- F. FEMA E-74 Reducing the Risks of Nonstructural Earthquake Damage 2012.
- G. ICC (IBC) International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. ICC-ES AC156 Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components 2010, with Editorial Revision (2015).
- I. NFPA 13 Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. SMACNA (SRM) Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

# 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.

- 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
- 4. Seismic Controls:
  - a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
  - b. Coordinate the work with other trades to accommodate relative positioning of essential and non-essential components in consideration of seismic interaction.
- 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.

# PART 2 PRODUCTS

## 2.1 VIBRATION ISOLATION REQUIREMENTS

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing fire suppression equipment.
- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
  - 1. Select vibration isolators to provide required static deflection.
  - 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
  - 3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.

# 2.2 SEISMIC CONTROL REQUIREMENTS

- A. Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.
- B. Seismic Design Criteria: ICC (IBC).
- C. Component Importance Factor (Ip): Fire suppression components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.
- D. Seismic Qualification of Equipment:
  - 1. Provide special certification for fire suppression equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
  - 2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.

- 3. Notify Architect and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
- 4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.
- E. Seismic Restraints:
  - 1. Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
  - 2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
    - a. ASHRAE (HVACA).
    - b. FEMA 412.
    - c. FEMA 413.
    - d. FEMA 414.
    - e. FEMA E-74.
    - f. SMACNA (SRM).
  - 3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third party registered professional engineer acceptable to authorities having jurisdiction.
  - 4. Seismic Restraint Systems:
    - a. Arrange restraint elements to avoid obstruction of sprinklers in accordance with NFPA 13.
    - b. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
    - c. Use only cable restraints to restrain vibration-isolated fire suppression components.
    - d. Use only one restraint system type for a given fire suppression component or distributed system (e.g. piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
    - e. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain fire suppression component in all lateral directions; consider bracket geometry in anchor load calculations.
    - f. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported fire suppression component weight.
    - g. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported fire suppression component weight.
    - h. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.

- i. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
- j. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
- F. Seismic Attachments:
  - 1. Comply with support and attachment requirements of NFPA 13.
  - 2. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
  - 3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, andDo not use power-actuated fasteners.
  - 4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps, but not for sway bracing attachments as prohibited by NFPA 13.
  - 5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
  - 6. Concrete Housekeeping Pads:
    - a. Increase size of pad as required to comply with anchor requirements.
    - b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.
- G. Seismic Interactions:
  - 1. Include provisions to prevent seismic impact between fire suppression components and other structural or nonstructural components.
  - 2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
  - 3. Comply with minimum clearance requirements between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.
- H. Seismic Relative Displacement Provisions:
  - 1. Use suitable fittings or flexible connections, in accordance with NFPA 13, to accommodate:
    - a. Relative displacements at connections between components, including distributed systems (e.g. piping); do not exceed load limits for equipment utility connections.
    - b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
    - c. Design displacements at seismic separations.
    - d. Anticipated drifts between floors.

2. Provide clearance around fire suppression system piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13.

### PART 3 EXECUTION

### 3.1 CODE-REQUIRED SPECIAL INSPECTIONS

- A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Contractor or Architect and statement of special inspections as required by applicable building code.
- B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
  - 1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
  - 2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
- C. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Architect acknowledging awareness of special requirements contained in the statement of special inspections.
- D. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

## 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- E. Vibration Isolation Systems:
  - 1. Clean debris from beneath vibration-isolated equipment that could cause short circuiting of isolation.
  - 2. Use elastomeric grommets for attachments where required to prevent short circuiting of isolation.
  - 3. Adjust isolators to be free of isolation short circuits during normal operation.
  - 4. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.
- F. Seismic Controls:
  - 1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.

- 2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
- 3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch (3 mm), use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch (3 mm) or less.
- 4. Equipment with Sheet Metal Housings:
  - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
  - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
  - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
- 5. Concrete Housekeeping Pads:
  - a. Size in accordance with seismic design to meet anchor requirements.
  - b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.

# END OF SECTION 21 05 48

# SECTION 21 05 53 IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

## PART 1 GENERAL

# 1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Ceiling tacks.

# 1.2 REFERENCE STANDARDS

A. ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

## **PART 2 PRODUCTS**

## 2.1 IDENTIFICATION APPLICATIONS

- A. Automatic Controls: Tags.
- B. Control Panels: Nameplates.
- C. Instrumentation: Tags.
- D. Major Control Components: Nameplates.
- E. Piping: Tags.
- F. Pumps: Nameplates.
- G. Relays: Tags.
- H. Small-sized Equipment: Tags.
- I. Valves: Nameplates and ceiling tacks where above lay-in ceilings.

# 2.2 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch (6 mm).
  - 3. Background Color: Black.
  - 4. Thickness: 1/8 inch (3 mm).
  - 5. Plastic: Comply with ASTM D709.

## 2.3 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

# 2.4 PIPE MARKERS

- A. Color: Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

## 2.5 CEILING TACKS

A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

## **PART 3 EXECUTION**

## 3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

# 3.2 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
  - 1. Identify service, flow direction, and pressure.
  - 2. Install in clear view and align with axis of piping.
  - 3. Locate identification not to exceed 20 feet (6 m) 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.
- F. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

## END OF SECTION 21 05 53

### **SECTION 22 00 00**

#### COMMON WORK RESULTS FOR PLUMBING

### PART 1 – GENERAL

### **1.1 APPLICABLE REQUIREMENTS**

- A. All work to be furnished and installed under this section shall comply with Division 01 General Requirements when available. If not available, the Contractor shall meet the requirements of these specifications.
- B. Where the Owner-Contractor Agreement contradicts this division, the more stringent shall apply.

### 1.2 RELATED REQUIREMENTS

A. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, including state/local building code, mechanical code, plumbing code, electrical code, fire code, and energy code.

### **1.3 GENERAL**

- A. Work included in 22 00 00 applies to Division 22 work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of plumbing systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications, Drawings, Addenda, Owner/Engineer Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. In the event there is a discrepancy between the drawings, specifications, and current code, the more stringent shall apply.
- Examine the Drawings, specifications and other Contract Documents relating to the Work and the work of all trades and become fully informed as to the extent and character of work required. Coordinate all work with that of others to ensure proper and complete installation of all materials, equipment and supports.
- E. Intent:
  - 1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete Plumbing systems, tested and ready for operation (hereinafter "Design Intent").
  - 2. Provide all items not specifically shown on the drawings, called for in the specifications or related Contract Documents, but required to conform to the labor, material and equipment to achieve the Design Intent.
  - 3. Provide all scaffolding, access provisions, tools, appliances, consumables, fees, permits and licenses, debris removal/disposal, supervision and labor, including required startup, check-out and training to provide complete and fully operable systems in full compliance with the Contract Documents.
  - 4. Before submitting a bid and prior to the start of work, Contractor shall examine all conditions relating to the Work, including that associated with the work of other trades upon which Contractor's work may rely or otherwise depend, to achieve the Design Intent, in accordance with the best trade practices, workmanship and highest quality product installation, taking into account the sequence of the work, delivery, storage and

hoisting requirements, requirements for access, testing and temporary services and all other site limitations and project complexities. Report to the Architect/Engineer any conditions which might prevent installation of materials and/or equipment in the manner intended by the Contract Documents or contrary to applicable codes, standards or regulations.

- 5. By submitting a bid, the Contractor represents that it has made a thorough examination of the site, of the work, including that associated with the work of other trades, all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.
- 6. No consideration or allowance will be granted for any alleged misunderstanding of materials, equipment or components to be furnished or work to be done; it being agreed that tender of proposal carries with it agreement to items, terms and conditions required by the Contract Documents.
- 7. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.
- F. Site Visit:
  - 1. Contractor shall visit the site and verify the exact conditions relating to the work and obtain such information as may be necessary to present a complete and comprehensive bid. No allowance will be made for any extra expense due to Contractor's failure to make such a visit and reasonably verify all actual/existing conditions. In the event of a conflict between existing conditions and the requirements of the Contract Documents, perform the necessary work to conform to Design Intent. The Owner or his representative will be the sole individual to interpret the intent of the Drawings in the event of a conflict between (1) existing conditions and those shown on the drawings, or (2) quality of existing material and quality of material indicated on the drawings or in the specifications. Wherever a conflict such as this occurs, the higher standard shall prevail.
- G. Conditions:
  - 1. Conform to all Bidding Requirements and general conditions.
  - 2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
  - 3. Modifications by this Section do not nullify any other portions of the above-referenced conditions.
- H. Make complete system installation, connecting to all equipment shown on the plans, or called for in the specifications. Contractor to provide any additional extra valves not shown on plans to obtain design criteria as required for a complete system and by the balancing contractor.
- I. Drawings:
  - 1. Drawings do not attempt to show all aspects of building construction, which will affect the installation of the systems. The drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, ductwork, etc. shown on the drawings, shall be followed
as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural, plumbing and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.

- 2. Verify exact distances between points shown on drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements.
- 3. Changes in design, configuration, or location of equipment, piping, or ductwork, advisable in the opinion of Contractor, shall be submitted to Architect/Engineer for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.
- 4. Check location of all work of all trades and avoid interferences. Conflicts shall be reported to Architect/Engineer for decision and direction. Special attention is called to the following items:
  - . Exact location of outlets shown on architectural details.
  - a. Location of suspended ceilings.

# **1.4 SPECIAL REQUIREMENTS**

- A. When applicable, Contractor acknowledges the ongoing operations of the Owner at or in close proximity to the Project and agrees to coordinate the timing of the Work with the Owner's ongoing operations; perform the Work in a manner that minimizes or eliminates and adverse impact upon the Owner's ongoing operations; confine operations at the site to areas approved by Owner, permitted by law, permits and the Contract Documents; comply with the Owner's standard security, health and safety policies and procedures; not unreasonably encumber the site with any materials or equipment; and not place signs or advertising on or about the site without prior approval of Owner.
- B. Where applicable, all seismic construction, restraints, bracing, mounts and hanging systems shall be in full compliance with the requirements of all Authorities Having Jurisdiction (AHJ's), pre-approval, certification and engineering (including certified engineering calculations and stamps). Contractor shall be solely responsible for obtaining and complying with all requirements of the AHJ.

## **1.5 DEFINITIONS AND ABBREVIATIONS**

- A. Finished Spaces: Spaces other than mechanical, plumbing and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical, electrical and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include spaces above hard or lay-in type ceilings and in duct shafts.

- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The word "provide," means "furnish and install."
- G. The word "approved," means acceptance by the Architect or Engineer.
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect/Engineer, requested by the Architect/Engineer, and similar phrases.

#### **1.6 REFERENCE STANDARDS AND GUIDELINES**

- A. Include but are not limited to the latest adopted editions from:
  - 1. ADA Americans with Disabilities Act
  - 2. AHRI Air-Conditioning Heating & Refrigeration Institute
  - 3. AMCA Air Moving and Conditioning Association
  - 4. ANSI American National Standards Institute
  - 5. ARI Air Conditioning and Refrigeration Institute
  - 6. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
  - 7. ASME American Society of Mechanical Engineers
  - 8. ASPE American Society of Plumbing Engineers
  - 9. ASSE American Society of Sanitary Engineering
  - 10. ASTM American Society of Testing Materials
  - 11. AWWA American Water Works Association
  - 12. AWS American Welding Society
  - 13. CFR Code of Federal Regulations
  - 14. CISPI Cast Iron Soil Pipe Institute
  - 15. EPA Environmental Protection Agency
  - 16. FM Factory Mutual Engineering Corporation
  - 17. GAMA Gas Appliance Manufacturers Association
  - 18. IAPMO International Association of Plumbing & Mechanical Officials
  - 19. ISO International Organization for Standardization
  - 20. MSS Manufacturers Standardization Society
  - 21. NEBB National Environmental Balancing Bureau
  - 22. NEC National Electric Code
  - 23. NEMA National Electrical Manufacturers Association
  - 24. NFPA National Fire Protection Association

- 25. OSHA Occupational Safety and Health Administration
- 26. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.
- 27. UL Underwriters Laboratories

# 1.7 SCOPE

- A. The work includes, but is not necessarily limited to, the furnishing of all labor, materials, equipment, tools, appliances, hoisting, scaffolding, supervision, for the proper execution and completion of the plumbing work and services necessary for, and reasonably incidental to, providing and installing complete piping systems, plumbing systems, and other plumbing work as shown or indicated in the Drawings and Specifications.
- B. The contractor is responsible for a complete and operational system installation. Contractor shall provide all necessary components for a complete and operational system even if such components are not specified or shown in the drawings or specifications. The contractor shall notify the Architect/Engineer of such mission for resolution prior to system installation.
- C. All new equipment and products as noted in Part 2 of each section shall be installed as per manufacturer's recommendations.
- D. Provide all additional piping, caps, and valves not shown on drawings, to maintain fully operational systems during the project at no additional cost to the owner.
- E. Consult all other Sections to determine the extent and character of this work specified else where.
- F. Make all connections to equipment requiring service from systems installed under this Section.

## **1.8 SUBMITTALS**

- A. Reference Division 1 for submittal requirements when available. If not available the contractor shall meet the requirements of these specifications.
- B. General
  - Review is for general conformance with the Contract Documents and is not intended to otherwise approve or verify dimensions, quantities, or to coordinate the Work shown on shop drawings on or between Contractor and the work of other trades or Sections. Contractor is solely responsible for quantities, dimensions, means and methods. Dimensions shall be confirmed and correlated by Contractor at the jobsite prior to the start of the Work (procurement, fabrication, construction or other commencement activities). Contractor's failure to fully verify conditions at the jobsite prior to commencement of the work shall not relieve Contractor of its obligations under the Contract Documents and Contractor shall be responsible for all damages caused by or related to its failure to comply with the requirements of this provision.
  - 2. Submittal review shall be performed to show compliance with the design intent. Contractor shall specifically note any deviations from the Contract Documents and explain the reason and nature of the deviation. Such deviations will be reviewed or rejected on the submittal. Deviations not so identified shall not relieve the Contractor from the requirements of the Contract Documents.
  - 3. Resubmittals will be reviewed for compliance with comment(s) made on the original submittal only. Architect/Engineer shall not be responsible for changes made upon resubmittal that are not clearly identified (highlighted), and responsive directly to the initial rejection. Resubmittals should not be packaged with non-related first-time

submittals, all resubmittals must be marked with the resubmittal number and date and must otherwise comply with all submittal requirements.

- 4. Submit shop drawings, commissioning plan(s) and checklists, penetration locations, supplemental data, etc. as may be required by the Contract Documents for all materials, equipment and other components of the work included in all Sections of this Division and other provisions of the Contract Documents in accordance with the requirements of this Division and referenced sections.
- 5. All submittals must be reviewed by Contractor, and bear Contractors review stamp and signoff for Conformity to the Contract Documents, prior to the submission of any required submittal to Architect/Engineer. Submittals that fail to meet this requirement will be considered incomplete, will not be reviewed by Architect/Engineer and will be returned to Contractor, without review and/or rejected and resubmittal will be required. Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
- 6. Forward all submittals to Architect/Engineer in a coherent, organized fashion, complete and packaged as required herein, Architect/Engineer may reject submittals that fail to comply with this or any other provision of the Contract Documents and Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
- 7. Subject to other provisions of the Contract Documents and in the absence of a more stringent requirement, Architect/Engineer will review a submittal not more than two (2) times. If a submittal is required to be reviewed more than twice due to incomplete, or incorrect information the contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
- 8. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or drawing/detail number, as applicable. In addition, for equipment submittals, include identification numbers appearing on the equipment schedule.
- 9. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.
- 10. Organize submittals in same sequence as they appear in specification sections, articles or paragraphs.
- 11. All materials and equipment submittals shall have a summary sheet at the front complete with catalog numbers. Where materials or equipment pertain to more than one building, submittals shall clearly indicate at which locations the materials or equipment is to be installed.
- 12. Submittals shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping and/or conduit entrance, access requirements for installation and maintenance, physical size and dimension, electrical characteristics and requirements, foundation/curbs and all permanent and temporary support details as well as all information relating to weight, including but not limited to live and dead weights and other information necessary for component verification and coordination with other trades.
  - Submittal Schedule Provide a detailed submittal schedule including all requirements of this Division and its subdivisions to the Architect and Engineer within thirty (30) days of contract award.

- i. Contractor shall submit for the Engineer's approval a Submittal Schedule for the performance of the work that is consistent with the requirements of the project schedule. The Submittal Schedule shall allow reasonable time for the Architect and other consultants review. If the time for Architects/Engineers review is not otherwise specified, the review period (from date of receipt) shall be a minimum of ten (10) business days. Once approved by the Architect/Engineer, submittal dates and time limits established by the Submittal Schedule shall not, except for reasonable cause, be changed or exceeded by the Contractor.
- ii. For each submittal required by the Contract Documents, the schedule shall include: specification section number, subsection/paragraph identification number, item description (as stated in the applicable specification section, subsection or other Contract Document) and the scheduled delivery date to the Architect/Engineer.
- iii. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project schedule resulting from any deviation to the approved Submittal Schedule, including but not limited to: payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer as may be required to perform out of sequence, stacked, critical, delayed, unscheduled or multiple reviews of required submittals necessitated by rejection of a prior submittal, (cumulatively and hereinafter, "Additional Review Costs")
- b. Catalog Cuts & Submittal Literature
  - i. Catalog cuts, submittal literature and published material may be included to supplement scale drawings provided that the actual make and model of equipment being submitted on is identified.
  - ii. Submittal literature, drawings and diagrams shall be specifically applicable to this project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item.
- c. Shop Drawings:
  - Shop drawings shall include all significant systems, equipment and components, including but not limited to all equipment, devices, connections and elevations. Include all related specialty rooms (i.e. mechanical, electrical, data/technology). Drawings shall be at a minimum scale of ¼" per 1'-0" and shall be fully coordinated with the work of other trades and/or sections.
  - ii. Identify congested areas and clearly indicate solutions to space problems, developed in conjunction with the work of other trades and/or Sections.
     Identification of space problems without proposed solutions is not acceptable and is grounds for rejection. For such areas indicate, superimposed, the work of all trades and/or Sections involved and:
    - 1. Clearly identify each area of congestion and deviations from the Contract Documents, and:
    - 2. Proposed solution(s), clearly documented and signed-off by all other trades and/or Sections involved.

- d. Anchorage and Supports: Submit details and calculations for support and anchors that are not specifically detailed on the drawings. All calculations must meet current seismic and structural code.
  - i. Provide details and calculations for equipment per local adopted building codes:
    - 1. Having an operating weight over 400 pounds or more and mounted directly to the floor.
    - 2. Having an operating weight over 20 pounds and suspended from the roof, floor, or wall or supported by vibration isolation devices.
  - ii. Where pre-approved bracing systems will be employed, submit:
    - 1. System component brochure describing components used and detailed installation instructions.
    - 2. Loads to be transmitted to the structure at anchor points.
  - iii. Where anchorage, support, and bracing are not detailed on the drawings, and pre-approved systems are not used, submit details and calculations of proposed systems. Include:
    - 1. Anchorage and Supports
      - a. Where equipment substitutions change the weight, size, configuration, or other aspects of systems and equipment that will affect the performance of anchorages and/or supports, submit calculations for proposed anchors and supports, and install them as shown in these calculations.
      - b. Where substitutions will have no effect on anchors and supports detailed on Contract Documents, submit information on sizes, weights, center of gravity and other relevant information to demonstrate this fact.
- e. Shop Fabrication Drawings: Drawings are for the Contractor's use and shall be its responsibility. Do not submit shop fabrication documents unless specifically requested.
- f. Testing: Coordinate Shop Drawings to include any additional components for proper system testing.
- g. Certificates: Submit final inspection certificates signed by governing authorities.
- h. Operating and Maintenance Instructions and Manuals.
  - i. Three (3) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner within ninety (90) days of issuance of final occupancy permit. Each set shall be electronic or permanently bound with a hard cover. The following identification shall be inscribed on the covers, "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor, and the Contract number. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8 1/2" x 11" with large sheets of Drawings folded in.

- ii. Instructions on major items, including but not limited to: pumps, air compressors, water heaters, water softeners, specialty units, controls, shall be by representative of manufacturer of respective equipment.
- iii. Submit as identified below and as noted in other specification references.
  - Names, addresses and phone numbers of contractors and subcontractors. List of all system components, with the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.
  - 2. Complete operating and maintenance instructions and parts lists of all equipment and component parts. Data sheets to show all connections, ratings, characteristics, wiring connections, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or failure, and description of operating, test, adjustment, and maintenance procedures.
    - a. Where data sheets included in manual cover equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
  - 3. Operating Instructions should include, but not be limited to:
    - a. Normal starting, operational and shutdown procedures, including emergency procedures for each type of equipment/system.
    - b. Equipment wiring and control diagrams.
    - c. All other items as may be specified/required by this Section and the Contract Documents.
  - 4. Maintenance Instructions
    - a. All items as may be specified/required by this Section and the Contract Documents.
  - 5. Manufacturers Data (each piece of equipment)
    - a. Installation instructions
    - b. Drawings & specifications
    - c. Parts List, including recommended stock and long lead parts/components.
    - d. Wiring and riser diagrams.
    - e. Warranties and guarantees for all equipment, materials and components, including repair, replacement and labor from both Contractor and manufacturer as required by the Contract Documents.
    - f. Certificates of Installation manufacturer's certification of supervision during equipment installation and start-up procedures.

- g. All other items as may be specified/required by this Section and the Contract Documents.
- i. Record Documents.
  - i. Maintain one (1) complete set of prints and specifications at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions, request for information and/or approved change orders. Record locations and depths of buried and concealed system components from fixed, easily identifiable objects, such as building walls or other fixed physical objects. Where systems are concealed in walls or other fixed physical objects, indicate distances from building corners or other building features not likely to be disturbed by fixture alterations.
  - ii. Submit Record Drawings within 90 days of system acceptance by owner.
- j. Drawings, specifications (as-builts) and approved submittals.
  - i. Where the project uses a BIM model the contractor shall keep the model updated in a similar fashion, maintaining the current project record as described above and submit, an addition to all other requirements of this Section and other provisions of the Contract Documents a complete and accurate BIM model for the project.
  - ii. Prior to Substantial Completion, obtain from the Architect a complete set of printed drawings at the Contractor's cost. Record all revisions to these drawings to indicate as-built conditions. Indicate all changes, including RFI's, on this set of documents. Submit one set of blueprints of these revised drawings for review. Make necessary changes and deliver to Architect one set of electronic documents, including any BIM model, upon Final Completion and Acceptance.
  - iii. All test reports, certifications, and inspection reports.
  - iv. AHJ/Specialty AHJ Approvals (i.e. Fire Marshal and/or Fire Department system approvals).
  - v. Substantial and Final inspection certificate signed by governing authorities.
  - vi. All other items as may be specified/required by this Section and/or other provisions of the Contract Documents.

## **1.9 EQUIPMENT DEVIATIONS AND SUBSTITUTIONS**

- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
- B. No substitutions will be allowed and/or considered unless the description of a product includes the phrase "approved equal" and then only upon a determination as to equivalency and impact upon the project budget, schedule and the work of others, including any redesign of the project or its system components by the Architect, Engineer or other trades. The final determination as to sufficiency or acceptance of any such substitution and/or deviation properly requested and submitted by Contractor will lie solely with the Architect/Engineer. Contractor may not implement substitutions that have not been approved by Architect/Engineer.
- C. Unless specified elsewhere in the Contract Documents, a minimum of two (2) weeks shall be allowed for evaluation of any substitution. The burden of all systems re-engineering/design,

testing, suitability and constructability is solely placed upon the Contractor for all deviations from the basis of design as reflected in the Contract Documents.

- D. If approved by Architect/Engineer, all such redesign, including all new drawings and detailing required, will be prepared by the Architect/Engineer and their sub-consultants for Change Order documentation for approval by Owner and the Authority Having Jurisdiction will be paid by the Contractor as part of the Deviation Review Costs.
- E. When the Engineer approves a substitution, the approval is given with the understanding that the Contractor guarantees the article or material substituted to be equal to or better in every respect than the article or material specified. The Contractor shall also assume complete responsibility that the article or material will fit the job as far as space, access, and servicing requirements.
- F. Where several materials are specified by name for one use, select for use any of those so specified subject to compliance with specified requirements.
- G. Whenever item or class of material is specified exclusively by detail specification, trade name, manufacturer's name or by catalog reference, use only such item, unless written approval is given. Submit written requests in accordance with these and referenced specifications.
- H. Make no substitutions for materials, articles or process required under contract unless written approval is obtained.

## 1.10 COORDINATION

- A. Prior to construction, coordinate installation and location of systems, devices and equipment with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
- B. Drawings and corresponding electronic media are diagrammatic and indicate the general arrangement of systems and work included in the Work. Consult the drawings, details and other electronic media for locations of fixtures and equipment; where same are not definitely located, obtain this information from the Architect/Engineer.
- C. Take all dimensions from Architectural and Structural Drawings, certified equipment drawings and from the actual field measurements before fabricating work. All conflicts shall immediately be reported to the Architect/Engineer. Contractor is solely responsible for conflicts known or which reasonably should have been known but not reported or resolved before commencement of the work.
- D. Coordinate connection of systems with interior/exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- E. Before submitting a bid for the work the Contractor shall visit the site and become familiar with all the work on other related Drawings and Specifications, and plan the work to provide the best possible assembly of the combined work of all trades. No additional costs will be considered for work which has to be relocated due to conflicts with other trades.
- F. If, after examination of the bidding documents relating to the work, the Contractor has queries concerning the nature and scope of the work or intent of the Specifications, he/she shall promptly request clarification from the Architect/Engineer. After contract award, claims of ignorance of the intent and scope of the contract shall not be allowed.

G. Contractor is responsible for coordinating the schedule of inspections by Engineer at appropriate stages of construction such as rough-in, pre-final, and final, and at other times required by the Specifications or by the construction. Notify Architect and Engineer seven (7) days in advance of proposed site visit. Notification constitutes certification that construction is, or will be, complete and ready for observation. In the event that construction is not ready for observation, contractor shall bear the cost of additional site visits.

## **1.11 COORDINATION DRAWINGS**

- A. Detail major elements, components, systems, equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  - a. Planned system distribution layout, including specialty device locations and access for operation
  - b. Clearances for installing and maintaining insulation.
  - c. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  - d. Equipment and accessory service connections and support details.
  - e. Other systems installed in same space.
  - f. Exterior wall and foundation penetrations.
  - g. Fire-rated wall and floor penetrations.
  - h. Ceiling and wall-mounted access doors and panels required to provide access to operating devices or items needing access for proper maintenance
  - i. Sizes and location of required concrete pads and bases.
  - j. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  - k. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

## 1.12 SEQUENCING AND SCHEDULING

- A. Coordinate equipment installation with other building components.
- B. Arrange for space, chases, slots, and openings in building structure during progress of construction to allow for distribution system installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of all materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Some equipment may require temporary installation during one phase and require relocation to final location under another phase. Provide all associated labor and materials to accommodate this phasing.
- F. Coordinate connection of all systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors if items requiring access are concealed behind finished surfaces. Access panels and doors will be required.

#### 1.13 ACCESSIBILITY

- A. Contractor is responsible for verifying that equipment and devices will fit within the space shown on the drawings. Contractor shall locate all equipment which must be serviced, operated or maintained, in fully accessible locations.
- B. Minor deviations from the drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without approval from the Architect/Engineer.

## 1.14 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed shall conform with all local, State, Federal and other applicable laws and regulations.
- B. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- C. Installer Qualifications: Company specializing in performing the work of this section. Company personnel shall be approved by manufacturer for all product installations and required training.
- D. Conform to all applicable standards, codes and regulation and industry best practice requirements.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. All materials and equipment shall be new, shall bear manufacturer's name, and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended. All equipment and components shall include UL label and/or marking on equipment body/device including manufacturer's name, pressure rating(s), electrical classification(s), limits and ratings as applicable to individual components for the purpose specified and intended.
- G. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the Drawings may be furnished, provided such proposed equipment is approved in writing and connecting plumbing and electrical services, such as pipe and/or duct connection sizes, circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. Maintain a minimum duct length of three straight diameters at all fan inlets and outlets. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.
- H. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.
- I. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.

- J. Listing and labeling: Provide motors that are listed and labeled. Terms "listed and labeled": as defined by UL, NEC, Article 100 or other applicable recognized agency as specified in the Contract Documents.
- K. Cutting & Patching: Unless otherwise required by the Contract Documents, Contractor shall be responsible for all cutting, fitting and patching required to complete the Work, or to make portions of the Work and existing conditions fit together properly, and all such areas shall be restored to the conditions existing prior to the cutting, fitting and patching unless otherwise provided in the Contract Documents
- L. Lead Free Requirements: Contractor shall endeavor to use lead free products and where required by law, ordinance, regulation or standard all materials products and practices shall comply with limitations and requirements as to the allowable limits and/or percentages of lead. Lead free products must be certified by and independent 3<sup>rd</sup> party.
- M. This provision shall apply to any and all similarly regulated materials, products and practices that may be considered hazardous or are otherwise regulated by applicable law, ordinance regulation or standard in the project local.

## 1.15 DELIVERY, STORAGE, AND HANDLING

- A. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage, and theft. At completion, all work, equipment and materials shall be cleaned, and damage repaired by Contractor. Damaged equipment will be replaced by the contractor if Owner does not accept repairs done to the equipment. Such replacement shall be scheduled to minimize building system interruption of occupied or scheduled for occupancy.
- B. Material delivered at the site shall not be left exposed to the weather or left unattended. Deliver pipes, tubes and conduit with factory-applied end-caps. Contractor shall be responsible to maintain end-caps or provide temporary end caps on all open-ended piping, tubes and conduit through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- C. Protect bright finished shafts, bearing housings and similar items until in service.
- D. Protect plastic pipes and materials from sunlight and support to prevent sagging and bending.
- E. Elevate stored materials above grade. When stored inside, do not exceed structural capacity of the floor.
- F. Provide protective coatings to materials to prevent damage and/or infiltration of moisture and dirt on all materials and equipment including but not limited to cast iron and steel valves.
- G. Contractor shall check the openings in the building and the size of the doors, passages, and openings through which equipment is to be admitted. Wherever necessary, he shall provide the equipment in sections or knocked down in order to admit the equipment through these openings.
- H. Contractor shall provide all rigging, erection and hoisting equipment as required to handle or place equipment and piping in position. This rigging and hoisting equipment shall only be attached and placed on the structure in locations as approved by Architect/Engineer at the site.

#### 1.16 PERMITS AND FEES

- A. Contractor shall arrange and pay for all permits, fees, and inspections required to perform the Work. The Contractor shall present the Owner with properly signed certificates of final inspection before the Work will be accepted.
- B. Contractor shall call for all inspections by local building official(s) when they become due, and shall not cover any work until approved by these governing authorities.
- C. Contractor shall make all arrangements with utility companies for water, steam, gas and drainage services, etc., associated with the work and include required payments for meters, piping, services, connection charges and materials furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

#### 1.7 DOCUMENT OWNERSHIP

A. The Drawings and Specifications, combined with the calculations, field data, notes, and reports, are the intellectual and real property of the Architect and/or Engineer. This covers all forms of written and recorded or electronic media. The reuse of these documents without specific permission of the Architect and Engineer is prohibited. The Drawings may be employed by the Owner and Contractor for the express use of constructing, commissioning and operating the facility only upon proper execution of an Agreement for Use of Electronic Files & Data.

#### 1.8 GUARANTEE AND WARRANTY

- A. Contractor warrants to Owner that the materials and equipment provided under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials and equipment not conforming to these requirements, including substitutions not properly approved by Change Order, shall be considered defective. This warranty excludes remedy for damage caused by improper or insufficient maintenance, improper operation or normal wear, tear and usage. Contractor shall assign to Owner, or otherwise assure the Owner has the full benefit of, all warranties and guarantees of manufacturer, subcontractors, sub-subcontractors and suppliers, and Contractor shall perform the Work in a manner that does not adversely affect or invalidate any available warranties or guarantees.
- B. Contractor shall warrant and guarantee all work against faulty material or workmanship for a period of one (1) year from the date of final completion and written acceptance by the Owner, unless specified more stringently elsewhere in the Contract Documents.
- C. If the project is occupied or the systems placed in operation in several phases at the request of the Owner, the guarantee of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation, tested, commissioned and accepted, in writing, by the Owner. The use of building equipment for temporary service and testing or phases of work completed prior to the projects final completion and acceptance by the Owner does not constitute the commencement of the warranty period.
- D. If a defect or deficiency in the Work is discovered within the one (1) year Warranty & Guarantee period or within such longer period as may be prescribed by the Laws or by any specific guarantee, and Owner elects to have Contractor correct such defect or deficiency, Owner shall notify Contractor of such defect or deficiency in writing. This period of correction relates only to the specific obligation to correct defects and deficiencies and in no way otherwise limits the Contractor's responsibility for Work that is not in accordance with the

Contract Documents, If Contractor fails to timely correct defects or deficiencies in the Work, Owner may, at its sole option, correct them and charge contractor for all cost therefore.

E. Specific exclusions, if any, from this one (1) year warranty and guarantee period are listed in the individual specification sections.

## 1.9 LIMITATIONS OF LIABILITY

- A. To the extent any of the following provisions are not more stringently included in the Contract Document the following Limitations of Liability shall apply:
- B. Architect/Engineer is not responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and is not responsible for Contractor's failure to perform or furnish the work in accordance with the Contract Documents.
- C. In the event that Architect/Engineer's employees or sub-consultants make comments or issue warnings about safety issues, such comments and warnings shall be considered to have been offered by a Good Samaritan and shall not impose any obligation or responsibility.
- D. Engineer will not be responsible for the acts or omissions of Owner, Contractor, any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the portions of the work
- E. Contractor understands and acknowledges that Engineer is not authorized to order extra work or issue Change Orders to the work, however in the event and to the degree that Engineer may offer advice, suggestions, and opinions Contractor shall not rely on such advice, suggestions, and opinions unless directed in writing by Owner or its designated representative, and shall, in no event, make any claim against the Engineer for any such advice, suggestions, and opinions.
- F. To the fullest extent permitted by law, Contractor shall indemnify and hold harmless Architect, Engineer, and their joint ventures, officers, directors, partners, employees and agents from and against any and all claims, costs, loses and damages (including but not limited to all fees and charge of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused in whole or in part by the negligent acts or omissions of Contractor, Contractor's officers, directors, partners, employees, agents; or contractor's subcontractors or material men in the performance of Work. Contractor shall direct its insurer to list Architect, Engineer, and their joint ventures, as Additional Insureds on general liability insurance policies covering this project. Prior to commencing work, Contractor shall submit copies of its certificate of insurance to both Architect and Engineer.

## 1.10 SAFETY

A. Contractors must conduct a weekly safety meeting with their employees and provide documentation as to attendance and topics of discussion. Engineer's construction support services do not constitute review or approval of Contractor's safety procedures. Contractor shall comply with all OSHA regulations. Contractor is required to obtain and pay for insurance required to cover all activities within Contractor's Scope of Work.

## 1.11 TEMPORARY CONSTRUCTION WATER

A. The Plumbing Contractor shall make all arrangements and provide necessary facilities for the temporary construction water from the Owner's source. Costs for the temporary construction water shall be paid for by Owner.

# PART 2 – PRODUCTS

# 2.1 MANUFACTURERS

- A. See Drawings for equipment data, capabilities, and requirements. Manufacturers are identified for the purpose of establishing quality; alternative manufacturers of equal quality are acceptable. If alternative manufacturers are proposed it is the contractor's responsibility to verify and demonstrate the proposed alternative is equivalent.
- B. Provide like items from one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.

## 2.2 MATERIALS

- 3. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by State, County, and City authorities. Provide all materials omitted herein but necessary to complete the work.
- D. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- E. All electrical materials shall bear the label of, or be listed by, the Underwriters' Laboratories (UL), unless the material is of a type for which label or listing service is not provided.
- F. Hazardous Materials: Comply with local, State of Oregon, and Federal regulations relating to hazardous materials. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

## 2.3 ACCESS PANELS

- A. Confirm Access Panel requirements in individual Division 22 sections. Comply with the following:
  - Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum of 24 x 24 or as required and approved size. Wall access panels to be minimum of 12 x 12 or as required and approved size.

## 2.4 DRAIN PANS

A. Provide drip pans under all hot water heaters, above-ceiling inline pumps, cooling coils and heat recovery coils. Locate pan immediately below piping and equipment, and extend a minimum of 6" on each side and lengthwise 18" beyond equipment being protected. Pans shall be 2" deep and fabricated from reinforced sheet metal (20 gauge copper or 20 gauge steel with two ounces zinc finish hot dipped after fabrication) with rolled edges and soldered or welded seams. Provide <sup>3</sup>/<sub>4</sub>" copper drainage piping, properly discharged to floor drain, hub drain, or as shown on Drawings. Provide condensate pumps as necessary. Comply with Oregon Mechanical Specialty Code for overflow protection and pipe sizing.

## 2.5 GUARDS

A. Provide guards in accordance with State Safety Code and OSHA requirements over all rotating equipment including belts, shafts and couplings. Drive guards over belts and sheaves shall include 2-1/2" diameter access opening at shaft ends for speed counter.

## 2.6 PENETRATION FIRE STOPPING

- A. Through-penetration fire stopping system tested and listed by Underwriters Laboratories.
  3M, Metacaulk, SpecSeal, or approved equivalent.
- B. Select system for proper application based on wall construction, type of penetrating item, wall rating, etc.

# 2.7 MISCELLANEOUS STEEL

- A. Provide all steel as required for adequate support of all equipment. Use standard angle or channel, I or H sections as required by application. Adequately cross-braced and welded pipe stands may be used for tank supports. Provide suitable base plates for all stands and anchors for all hanging equipment. Drill or burn support holes only in flanges of structural shapes and only in one leg of any one angle, and as far from center of length as possible.
- B. Paint: Apply one coat of black Rustoleum primer to shop fabricated items before delivery to the job; other painting as specified herein.

# PART 3 - EXECUTION

## 3.1 GENERAL PLUMBING INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of plumbing systems, materials, and equipment. Comply with the following requirements:
- B. Coordinate systems, equipment, and materials installation with other building components.
- C. Verify all dimensions by field measurements.
- D. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for system installations.
- E. Coordinate the installation of required supporting devices and sleeves to be set in poured-inplace concrete and other structural components, as they are constructed.
- F. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- G. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
- H. Coordinate connection of systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
- J. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
- K. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

- L. Install access panel or doors where units are concealed behind finished surfaces. Coordinate with other divisions.
- M. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
- N. Do not install piping in elevator machine rooms, electrical and/or communication rooms unless it directly services that room.

# 3.2 CONTINUITY OF SERVICE

- A. Contractor, in the performance of the Work shall plan for and incorporate into the work the continuity of services. Where the continuity of service(s) is required to be interrupted Contractor shall plan and schedule the work to minimize interruptions to the facility and its normal operations, prearrange and coordinate all outages/interruptions with Owner's representative, utilities and the work of others. Requests for system interruptions/outages must be submitted at least (5) days prior to intended shutdown time and then subject to Owner's adjustment and/or approval.
- B. For connections that require a significant interruption to facility operations (as determined by the Owner), Contractor shall provide for Owner's written approval a detailed plan, schedule and description of the work for each system interruption. The plan shall include a description and schedule of each work item to be completed, designation of site supervisor and contact information, designated work crew as well as facility access and egress points for materials, manpower and equipment, contingency plan for parts, materials and equipment as well as a program to restore systems in the event of unplanned disruption or inability to complete the work in the timeframe scheduled and approved by Owner. Contractor shall confirm scheduled dates with the Owner and provide a minimum of five (5) days advance notice for each operation.
- C. Where possible and subject to Owners sole discretion, connections to existing systems shall be performed during normal operating conditions. Unless required otherwise (specifications, code, practice, etc.) all tap connections shall be 'live', 'wet' or 'hot', with the proper safety programs and procedures for isolating system components to ensure the safety of the workforce, occupants and the facility.
- D. Contractor shall include all costs for overtime labor, expedited materials, equipment and contingency planning as necessary to maintain continuity of services, schedule and complete necessary connections. Contractor shall also include provisions for maintaining any and all supplemental systems that may be required to remain in service for the safety, protection and critical operations of the facility and its occupants including but not limited to: Fire Alarm, Security, Phone/Data, BAS, Emergency Power and similarly related critical or emergency systems. Such provisions shall include but not be limited to temporary power, lighting, materials, equipment and/or installations (including removal and cleanup thereof) required to maintain such systems and as required to safely and properly complete the work.
- E. Contractor shall be liable for any and all damages resulting from unscheduled outages/interruptions or for those not confined to the pre-approved timeframes to complete the work.

## 3.3 DEMOLITION

- A. Comply with individual Division 22 sections and the following:
  - 1. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.

- Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
- 3. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.
- 4. Unless specifically indicated otherwise on Drawings, remove exposed, unused systems to behind finished surfaces (floor, walls, ceilings, etc.). Cap and patch surfaces to match surrounding finish.
- 5. Unless specifically indicated otherwise on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).
- B. If duct, pipe, insulation, conduits, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Reuse of Materials: Reuse of materials is prohibited unless specifically indicated or approved by Architect.
- D. Notify Architect in discovery of any hazardous materials.
- E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

# 3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping systems as described below, unless piping Sections specify otherwise. Individual Division 22 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install flexible connectors according to manufacturer's written instructions and where indicated and specified in other Division 22 sections.
- L. Install flexible expansion loops according to manufacturer's written instructions and where indicated and specified in other Division 22 sections.

- M. Install fittings for changes in direction and branch connections.
- N. Install couplings according to manufacturer's written instructions.
- O. Install Portable Instrument Connections in all piping systems where DDC temperature and/or pressure sensors and thermometers and/or pressure gauges are located.
- P. Do not route piping through elevator equipment rooms, unless specifically allowed by local authority.
- Q. Do not route piping over electrical panels, transformers, switchgear or other electrical equipment.
- R. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
  - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chromeplated finish. Use split-casting escutcheons if required, for existing piping.
  - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
  - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
  - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
  - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- S. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - a. Cut sleeves to length for mounting flush with both surfaces.
  - 1. Exception: Extend sleeves installed in floors of Plumbing equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Build sleeves into new walls and slabs as work progresses.
  - 3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
    - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsumboard partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. If available, refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1. Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.
        - Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
      - 2. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and Plumbing sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing Plumbing sleeve seals.
        - i. Install steel pipe for sleeves smaller than 6 inches in diameter.

- ii. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
- iii. Assemble and install Plumbing sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- 3. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using Plumbing sleeve seals. Size sleeve for manufacturer's recommended clear space between pipe and sleeve.
  - i. Assemble and install Plumbing sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
  - ii. Caulk exterior side of annular space once the Plumbing sleeve seal is in place using an elastomeric joint sealant.
- 4. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. If available, Refer to Division 7 Section "Firestopping" for materials.
- 5. Verify final equipment locations for roughing-in.
- 6. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- 7. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
  - i. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  - ii. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  - Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
  - iv. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  - v. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - vi. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
  - vii. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
  - viii. Align threads at point of assembly.
  - ix. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
- 8. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- i. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators.
- Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench to recommended torque valves.
- 9. Piping Connections: Make connections according to the following, unless otherwise indicated:
  - i. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
  - ii. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
  - iii. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - iv. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
- 10. Identification
- 1. Valves:
  - . Attach 1 1/2" square brass tags stamped with designating number 1/2" high, filled in with red enamel, to each valve.
  - a. Securely fasten valve tag to valve spindle or handle with a brass chain.
- 2. Schedules and Charts:
  - . Furnish to Owner's representative three (3) complete framed plastic laminated valve tag schedules. Schedule shall indicate tag number, valve location by floor and nearest column number, valve size and fire area controlled.
  - a. Furnish three (3) framed plastic laminated diagrammatic charts showing schematically the complete sprinkler system, with major control valves and valve numbers.
  - b. Furnish one (1) framed plastic laminated placard at each sprinkler riser, indicating the basic hydraulic data as required by NFPA 13 or local Fire Marshal.
- 3. Piping Identification:
  - . Apply color coded polyvinyl chloride pipe bands identifying service and direction of flow.
  - a. On exposed piping, apply bands at 20'0" on centers at straight runs, at valve locations, and at points where piping enters and leaves a partition, wall, floor, or ceiling.
  - b. On concealed piping installed above removable ceiling construction, apply bands in manner described for exposed piping.

- c. On concealed piping installed above non-removable ceiling construction, or in pipe shafts, apply bands at valves or other devices that are made accessible by means of access doors or panels.
- d. Apply bands at exit and entrance points at each piece of equipment.
- e. Band widths shall be 8" for pipes up to 10" diameter, and 16" for larger diameter piping. Letter heights stating service shall be pre-printed on band, 3/4" high for 8" bands and 1 1/4" high for 16" bands.
- f. Colors shall conform to ASA Standard A13.1.
- g. Tags and bands shall be approved for this service.
- 4. Sprinkler Drains and Test Connection
- 5. Provide all necessary drain valves, drain risers, capped nipples, auxiliary piping, etc. as required to drain the system risers and mains, and all trapped portions of the system. Drain valves which are not connected to drain pipes leading to floor drains shall be hose end type.
- 6. Main drains and test connections shall be piped to spill on/in floor drain or grade on concrete splash block.
- 7. Provide all piping required to spill the drains and test connections to the floor, funnel or other drainage connections provided under the plumbing contract, or arrange with the plumbing trade to provide additional drainage facilities, in which case pay all charges related to the additional plumbing construction work.

#### 3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install Plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.

#### 3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor Plumbing materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

#### 3.7 DRAWINGS

- A. The Drawings show the general arrangement and location of the piping and equipment. Work shall be installed in accordance with the Drawings, except for changes required by conflicts with the work of other trades. The Contractor shall provide for the support, expansion, and pitch of any rearranged piping in conformance with the intent of the Drawings, Specifications, and codes.
- B. Note that certain mechanical work is shown, wholly or in part, on Architectural Drawings.

- C. Mechanical Drawings are diagrammatic and are intended to show the approximate location of equipment and piping. Dimensions shown on Drawings shall take precedence over scaled dimensions on Drawings. All dimensions shall be verified in the field by the Contractor.
- D. The exact location of apparatus, equipment, and piping shall be ascertained from the Owner or the representative in the field, and work shall be laid out accordingly. Should the Contractor fail to ascertain such locations the work shall be changed at Contractor's own expense when so ordered by the Owner. The Engineer reserves the right to make minor changes in the location of piping and equipment up to the time of installation without additional cost.
- E. It is the intention of the Drawings and Specifications that, where certain mechanical items such as unions, expansion joints, and other mechanical components are not shown, but where such items are required by the nature of the work, shall be furnished and installed.
- F. The Mechanical Drawings and Specifications are intended to supplement each other. Any material or labor called for in one shall be furnished even though not specifically mentioned in the other.
- G. Pipe and duct sizes shown are the minimum allowable and shall be increased in size if required by code or wherever necessary to meet unusual conditions.

## I DAMAGE

- 1. Repair any damage to the building, premises, and equipment occasioned by the work under this Section.
- 2. Repair all damage to any part of the building or premises caused by leaks or breaks in pipe, or malfunctions of equipment furnished or installed under this Section until the warranty period expiration date.

## **II. EARTHWORK**

- 1. General: Perform earthwork required for installation of new work below grade in accordance with referenced specifications.
- 2. Excavate trenches to uniform widths to provide a working clearance on each side of the pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated. Grade trench bottoms to provide uniform bearing and support for each section of pipe. Form holes and depressions for joints after trench bottom has been graded. Provide temporary pumping equipment to keep excavation free from water. Install pipe bedding in rock excavation consisting of not less than 6 inch of sand or equivalent material.
- 3. Provide bracing and shoring as necessary.
- 4. Backfill trenches only after completion of pressure tests and inspection. Carefully compact material under pipe and bring backfill evenly up on both sides and along the full length of piping or conduit. Cover to 12-inch thickness over top of pipe. Fill and tamp remainder of backfill material in 6-inch layers. Provide backfill materials generally consisting of clean earth or sand relatively free of clods or stones. For sewer and water piping, use pea gravel. For gas piping, use sand. Backfill under, around, and to 6 inch above top of piping.
- 5. Compact soil to 6-inch layer (maximum) loose thickness of backfill. Where roadway or parking area surfaces will be placed over backfill, provide moisture conditions, which will produce compacted density of 95 percent of maximum density. Elsewhere, 90 percent. Test in accordance with Divisions 1 and 2 (if available) and code (most stringent to prevail).

- 6. Take special care in compacting under services where they enter building to prevent settling. Contractor fully responsible for damage to piping and property as a result of settling around service piping.
- 7. Dispose surplus materials off-site in a suitable location.
- 8. Place and maintain barricades, construction signs, torches, lanterns, and guards as required during periods of open excavation to protect persons from injury and to avoid property damage.
- 9. Leave premises thoroughly clean at completion of earthwork.
- 10. Wherever piping is to be installed in areas, which have been excavated below pipe inverts, for any purpose, install piping to prevent subsequent settlement. Do not install piping until backfill is to full compaction, completed to minimum 18 inch above installed pipe. Install piping in re-excavated trenches and backfill as previously specified.

#### **III. CONCRETE WALLS AND CONCRETE FOOTINGS**

- Where pipes must pass through concrete walls and footings, they shall pass through SDR 35 PVC pipe sleeves with 1/2" annular space set in place at time of construction.
- 2. Sheetmetal sleeves set into concrete walls: Provide steel frame around opening where required by Structural Engineer.
- Coordinate core drilled openings with other divisions. Coordination shall include location, size, and spacing of openings. No slot openings will be allowed. Coordinate openings to avoid critical structural items such as reinforcing bars, tensioning tendons, etc.

# IV. ELECTRICAL REQUIREMENTS - CONTROLS AND COORDINATION WITH ELECTRICAL CONTRACTOR

- Contractor shall coordinate with the Electrical Contractor on furnishing and installing of controls, motors, starters, etc. Coordinate means informing Electrical Contractor of items requiring electrical connection, providing copies of submittal data, installation data, scheduling work to insure efficient progress, and promptly supplying those items to be installed by Electrical Contractor.
- 2. The specific requirements for electrical power and/or devices for each and every piece of mechanical and plumbing equipment requiring electrical service, supplied and/or installed under this Contract, shall be coordinated and verified with the Mechanical and Plumbing Drawings, the Mechanical and Plumbing Sections of these Specifications, and with the manufacturers of the mechanical and plumbing equipment supplied. This shall include the voltage, phase, and ampacity; conduit requirements; and exact location and type of disconnect, control, and/or connection required. Any changes from the Drawings and Specifications required as a result of this coordination shall be part of this Contract.
- 3. Electrical Contractor shall furnish and install the following for all mechanical equipment:
  - a. Conduit and wiring for line voltage power to the equipment.
  - b. Disconnect switches.
  - c. Manual motor starters.

- d. Magnetic motor starters when part of a motor control center. See Division 26 and Drawings for further information.
- 4. The work under this Section shall include furnishing and installing all controls on low and manual line voltage, including thermostats, auxiliary switches, relay wiring, interlock wiring; equipment control panels and transformers; and controls conduit unless specifically indicated as part of other work. Materials and methods of the control installation shall be in accordance with the Electrical Specifications.
- 5. The Mechanical Contractor shall review all wiring connections which have any influence on this equipment or work and verify that these connections are correct before permitting any equipment to be operated which is furnished, installed, or modified under this Contract.

# V. ELECTRICAL EQUIPMENT ROOM PRECAUTIONS

1. Ductwork or piping for mechanical systems shall not be installed in any switchgear room, transformer vault, telephone room or electric closet except as indicated. In any case, no ductwork or piping for mechanical systems shall be installed in the space equal to the width and depth of any electrical service equipment, switchboards, panel boards, or motor control centers and extending from the floor to a height of six feet above the equipment or to the structural ceiling, whichever is lower.

## VI. CUTTING AND REPAIRING

- 1. No cutting shall be done except with approval. Cutting of structural members or footings is prohibited without the prior written consent of the Structural Engineer.
- 2. Where cutting of paving, walls, ceilings, etc. is necessary for the installation of the mechanical work, it shall be done under the direction of this Section. Damage caused by this cutting shall be repaired to match original and adjacent surfaces without additional expense to the Owner. Cutting of new construction shall be by the installing Contractor of that construction as directed by this Contractor.

## VII. ACCESSIBILITY

- General: Valves, damper operators, filters, thermometers, pressure gauges, clean-out fittings, and indicating equipment or specialties requiring reading, adjusting, inspection, repairing, removal, or replacement shall be conveniently and accessibly located with reference to finished building. Thermometers and gauges installed to be easily read from floor.
- 2. Panels: No unions, flanges, valves, dampers, controls, or equipment shall be placed in a location that will be inaccessible after the system is complete. Access panels or doors shall be provided where required whether or not shown on Drawings.
- 3. Access Panels in Walls or Ceilings:
  - Provide access panels in walls or ceilings. Milcor or approved equal, where indicated and where required to provide access to valves, dampers, and other appurtenances. Panels shall be style as selected by and as directed by wall or ceiling construction. Panel size shall be 24" x 24" unless indicated otherwise. Panels in acoustical barriers shall have same transmission loss as barrier. Panels in rated construction shall have same rating as construction in which installed.
  - b. Door panels shall be no lighter than 14 gauge steel. Doors shall be equipped with concealed spring hinges and flush, screwdriver operated locks, except that key operated locks shall be used for all access doors in walls where door is within 6'0" of floor. Locks for all key operated doors shall be keyed alike.

- c. Doors in ceramic tile surfaces shall be stainless steel or chrome plated. Doors in other finished surfaces shall be prime coated.
- 4. Equipment Spaces: Provide aisles between equipment and piping, ducts, electrical gear, etc. for complete service and inspection of equipment. Maintain minimum 6'6" headroom in all access aisles. Maintain minimum 36" clearance at all service panels. Provide minimum clearances at electrical equipment per NEC. Provide 36" wide, 3/4" thick plywood covered catwalks in attics from access door to equipment.

#### VIII. TESTING

 Test all piping, ductwork, equipment, and systems as called for in the Specifications. Notify and inspection authorities prior to testing so that they may be witnessed. Protect all personnel and equipment during testing. Where Specifications do not cover specific points or methods, conform to manufacturer's specifications.

## IX. OPENINGS

1. Locating and sizing of all openings for pipe, conduit and ductwork through walls, roof, etc. shall be done under this Division. Framing of openings shall be done by the respective trades in whose work the opening is made.

#### X. EQUIPMENT

- 1. All equipment shall be accurately set and leveled. Supports shall be neatly placed and properly fastened. All equipment shall be fastened in place with bolts.
- 2. Keep all openings closed with plugs or caps to prevent entrance of foreign matter. Protect all piping, ductwork, fixtures, and equipment against dirt, water, chemical, or mechanical damage both before and after installation. Any equipment or apparatus damaged prior to final acceptance shall be restored to original condition or replaced at the discretion and at no additional cost to the Owner.
- 3. Start-Up: Equipment shall be adjusted, lubricated, aligned, etc. prior to start-up. Inspect each piece of equipment prior to start-up. Start each piece of equipment in accordance with manufacturer's directions and warranty requirements.
- 4. Finish: Protect all equipment and materials until in use. Any visible rust or corrosion shall be removed as directed prior to installation. All damaged factory painted finishes shall be cleaned and painted with manufacturer provided paint.

## XI. MANUFACTURER'S DIRECTIONS

- Materials and equipment shall be installed in accordance with manufacturer's application and recommendations, requirements, and instructions, and in accordance with Contract Documents. Where manufacturer's instructions differ from those indicated or specified, they shall be brought to attention for resolution prior to equipment ordering and installation.
- 2. Where requirements indicated in Contract Documents exceed manufacturer's requirements, Contract Documents shall govern.

## XII. FURRING AND PIPE SPACES

- 1. Spaces provided in the design of the building shall be utilized and the work shall be kept within the furring lines established on the Drawings.
- Layout: Maintain maximum head room under piping and equipment. Contractor to coordinate line locations with beams, windows, etc. to provide maximum clearance. From Drawings, ascertain heights of suspended ceilings and size of pipe shafts in

which piping is concealed, and location and size of structural members in and adjacent to pipe shafts. Coordinate piping installation with ductwork, lighting, and other equipment. Ensure necessary clearances on trim plates at exposed penetrations of walls and floors. If sufficient room is not available above suspended ceiling or vertical shafts obtain clarification from before work is started.

#### XIII. CLEAN-UP

- 1. During the course of work under this Section, all rubbish, debris, surplus materials, tools, etc. resulting from this work shall be removed from work area and shall be disposed of off-site at the end of each working day. The Owner's premises shall be left clean and in a condition acceptable to the .
- 2. Clean all work installed under this Contract to satisfaction of Owner and submit documentation that each system has been cleaned and results witnessed by the representative.
- 3. All water distribution and piping systems, including those for cold water and hot water systems, shall be flushed thoroughly until piping is cleaned to satisfaction of the . See other Specification Sections for additional requirements.

#### XIV. ENGRAVED NAMEPLATES

1. Furnish and install plastic laminated engraved nameplates with 1/4" minimum lettering at panel mounted control devices, manual control stations, power disconnects, motor starters and pieces of equipment. Nameplates exposed to weather shall be engraved brass.

#### **XV. FINAL INSPECTION**

1. The Contractor shall furnish the certificates of final inspection and approval from the inspection authorities having jurisdiction.

## XVI. SITE VISITS BY ENGINEER

- 1. Engineer's responsibility is limited to normal construction support services only, consisting of office consultation, site visits, and reports at appropriate stages of construction such as rough-in, pre-final, and final.
- 2. If the Engineer is requested for a site visit and the work performed to that point is not able to be reviewed, requiring an additional site visit, all costs incurred by the Engineer for additional site visits or office shall be paid for by that Contractor.

# END OF SECTION 22 00 00

#### SECTION 22 05 16

#### EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

#### PART 1 - GENERAL

## **1.1 SECTION INCLUDES**

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

#### **1.2 REFERENCE STANDARDS**

- A. ASME B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2015.
- B. ASME B16.5 Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard 2017.
- C. EJMA (STDS) EJMA Standards Tenth Edition.
- D. UL (DIR) Online Certifications Directory Current Edition.

## PART 2 - PRODUCTS

#### 2.1 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

- A. Inner Hose: Bronze.
- B. Exterior Sleeve: Braided bronze.
- C. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).
- D. Joint: Flanged.
- E. Size: Use pipe sized units.
- F. Application: Copper piping.

#### 2.2 EXPANSION JOINTS - TWO-PLY BRONZE BELLOWS TYPE

- A. Construction: Bronze with anti-torque device, limit stops, internal guides.
- B. Pressure Rating: 125 psi and 400 degrees F (862 kPa and 204 degrees C).
- C. Maximum Compression: 1-3/4 inches (45 mm).
- D. Maximum Extension: 1/4 inch (6 mm).
- E. Joint: Soldered.
- F. Size: Use pipe sized units.
- G. Application: Copper piping.

# 2.3 EXPANSION JOINTS - HOSE AND BRAID

A. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support bracket and air release or drain plug.

B. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.

# **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- D. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

#### END OF SECTION 22 05 16

## SECTION 22 05 17

#### SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

#### PART 1 - GENERAL

#### **1.1 SECTION INCLUDES**

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

#### **1.2 REFERENCE STANDARDS**

- A. ASTM C592 Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2016.
- B. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

#### **1.3 QUALITY ASSURANCE**

A. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

## PART 2 - PRODUCTS

#### 2.1 PIPE SLEEVES

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
  - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- B. Plastic or Sheet Metal: 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 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.
- E. Clearances:
  - 1. Provide allowance for insulated piping.

- 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
- 3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

#### 2.2 MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Modular/Mechanical Seal:
  - 1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
  - 2. Provide watertight seal between pipe and wall/casing opening.
  - 3. Elastomer element size and material in accordance with manufacturer's recommendations.
  - 4. Glass reinforced plastic pressure end plates.

# PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

#### 3.2 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Structural Considerations:
  - 1. Do not penetrate building structural members unless indicated.
- E. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  - 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  - 2. Aboveground Piping:
    - a. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
  - 3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
  - 4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- F. 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.
- G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

#### 3.3 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

# END OF SECTION 22 05 17

#### SECTION 22 05 19

#### METERS AND GAUGES FOR PLUMBING PIPING

#### PART 1 - GENERAL

## **1.1 SECTION INCLUDES**

- A. Pressure gauges and pressure gauge taps.
- B. Thermometers and thermometer wells.
- C. Static pressure gauges.

#### **1.2 REFERENCE STANDARDS**

- A. ASME B40.100 Pressure Gauges and Gauge Attachments 2013.
- B. ASTM E1 Standard Specification for ASTM Liquid-in-Glass Thermometers 2014.
- C. ASTM E77 Standard Test Method for Inspection and Verification of Thermometers 2014, with Editorial Revision (2017).
- D. UL 393 Indicating Pressure Gauges for Fire-Protection Service Current Edition, Including All Revisions.

## PART 2 - PRODUCTS

#### 2.1 PRESSURE GAUGES

- A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
  - 1. Case: Steel with brass bourdon tube.
  - 2. Size: 4-1/2 inch (115 mm) diameter.
  - 3. Mid-Scale Accuracy: One percent.
  - 4. Scale: Psi and kPa.

#### 2.2 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi (1034 kPa).

## 2.3 STEM TYPE THERMOMETERS

- A. Thermometers Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
  - 1. Size: 9 inch (225 mm) scale.
  - 2. Window: Clear Lexan.
  - 3. Accuracy: 2 percent, per ASTM E77.
  - 4. Calibration: Degrees F.

# 2.4 DIAL THERMOMETERS

- A. Thermometers Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
  - 1. Size: 5 inch (125 mm) diameter dial.
  - 2. Lens: Clear glass.
  - 3. Accuracy: 1 percent.
  - 4. Calibration: Degrees F.

#### 2.5 TEST PLUGS

A. Test Plug: 1/4 inch (6 mm) or 1/2 inch (13 mm) brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F (93 degrees C).

# **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.
- C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- D. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Refer to Section 230943. Where thermometers are provided on local panels, duct or pipe mounted thermometers are provided on local panels, duct or pipe mounted thermometers are not required.
- E. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- F. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- G. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- H. Locate test plugs adjacent thermometers and thermometer sockets.

## END OF SECTION 22 05 19

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#### SECTION 22 05 23

#### **GENERAL-DUTY VALVES FOR PLUMBING PIPING**

#### PART 1 - GENERAL

#### **1.1 SECTION INCLUDES**

- A. Applications.
- B. General requirements.
- C. Ball valves.
- D. Butterfly valves.
- E. Check valves.
- F. Gate valves.

#### **1.2 REFERENCE STANDARDS**

- A. API STD 594 Check Valves: Flanged, Lug Wafer, and Butt-Welding 2017.
- B. ASME B1.20.1 Pipe Threads, General Purpose (Inch) 2013.
- C. ASME B16.5 Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard 2017.
- D. ASME B16.34 Valves Flanged, Threaded and Welding End 2017.
- E. ASME B31.9 Building Services Piping 2014.
- F. ASTM A536 Standard Specification for Ductile Iron Castings 1984 (Reapproved 2014).
- G. ASTM B61 Standard Specification for Steam or Valve Bronze Castings 2015.
- H. ASTM B62 Standard Specification for Composition Bronze or Ounce Metal Castings 2017.
- I. MSS SP-72 Ball Valves with Flanged or Butt-Welding Ends for General Service 2010a.
- J. MSS SP-80 Bronze Gate, Globe, Angle and Check Valves 2013.
- K. MSS SP-110 Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010.
- L. MSS SP-125 Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves 2010.
- M. NSF 61 Drinking Water System Components Health Effects 2017.
- N. NSF 372 Drinking Water System Components Lead Content 2016.

#### **1.3 QUALITY ASSURANCE**

- A. Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.

#### PART 2 - PRODUCTS

## 2.1 APPLICATIONS

A. See drawings for specific valve locations.

## 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. Gear Actuator: Quarter-turn valves 8 NPS (200 DN) and larger.
  - 2. Handwheel: Valves other than quarter-turn types.
  - 3. Hand Lever: Quarter-turn valves 6 NPS (150 DN) and smaller except plug valves.
- D. Valves in Insulated Piping: With 2 NPS (50 DN) 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. Valve-End Connections:
  - 1. Threaded End Valves: ASME B1.20.1.
  - Pipe Flanges and Flanged Fittings 1/2 NPS (15 DN) through 24 NPS (600 DN): ASME B16.5.
- F. General ASME Compliance:
- G. Source Limitations: Obtain each valve type from a single manufacturer.

#### 2.3 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.

## 2.4 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 check valves where necessary to maintain direction of flow as follows:
  - 1. Lift Check: Install with stem plumb and vertical.
  - 2. Swing Check: Install horizontal maintaining hinge pin level.

## END OF SECTION 22 05 23
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## **SECTION 22 05 29** HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

## **PART 1 - GENERAL**

## **1.1 SECTION INCLUDES**

A. Support and attachment components for equipment, piping, and other plumbing work.

## **1.2 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 the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - Do not install products on or provide attachment to concrete surfaces until concrete has 1. fully cured in accordance with Section 033000.

## **1.3 QUALITY ASSURANCE**

A. 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 plumbing 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 with a minimum safety factor. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 4. Do not use wire, chain, perforated pipe strap or wood for permanent supports unless specifically indicated or permitted.
  - 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.
- 6. 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. Metal Channel (Strut) Framing Systems:
  - 1. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  - 2. Comply with MFMA-4.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
  - 1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch (13 mm) diameter.
    - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
    - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.
- D. Thermal Insulated Pipe Supports:
  - 1. General Construction and Requirements:
    - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    - c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch (12.7 mm to 762 mm) iron pipes.
    - d. Insulation inserts to consist of polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
  - 2. PVC Jacket:
    - a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
    - b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
    - c. Thickness: 60 mil (1.524 mm).
- E. Anchors and Fasteners:
  - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  - 2. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Comply with MFMA-4.
    - b. Channel Material: Use galvanized steel.
    - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

## 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, 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. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- H. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- J. Secure fasteners according to manufacturer's recommended torque settings.
- K. Remove temporary supports.

## 3.3 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

#### END OF SECTION 220529

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#### **SECTION 224000**

PLUMBING FIXTURES

PART 1 - GENERAL

#### **1.1 SECTION INCLUDES**

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Under-lavatory pipe supply covers.
- G. Electric water coolers.
- H. Drinking fountains.
- I. Bathtubs.
- J. Showers.

#### **1.2 REFERENCE STANDARDS**

- A. ADA Standards Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.18.9 Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011.
- C. ASTM C1822 Standard Specification for Insulating Covers on Accessible Lavatory Piping 2015.
- D. ANSI Z124.1.2 American National Standard for Plastic Bathtub and Shower Units 2005.
- E. ASME A112.6.1M Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- F. ASME A112.18.1 Plumbing Supply Fittings 2018.
- G. ASME A112.19.1 Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures 2018.
- H. ASME A112.19.2 Ceramic Plumbing Fixtures 2013.
- I. ASME A112.19.3 Stainless Steel Plumbing Fixtures 2017.
- J. ASME A112.19.4M Porcelain Enameled Formed Steel Plumbing Fixtures 1994 (R2009).
- K. ASME A112.19.5 Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2017.
- L. ASSE 1014 Performance Requirements for Backflow Prevention Devices for Hand-Held Showers 2005.
- M. ASSE 1070 Performance Requirements for Water Temperature Limiting Devices 2015.
- N. ICC A117.1 Accessible and Usable Buildings and Facilities 2017.
- O. NSF 61 Drinking Water System Components Health Effects 2017.
- P. NSF 372 Drinking Water System Components Lead Content 2016.

## **1.3 SUBMITTALS**

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Manufacturer's Instructions: Indicate installation methods and procedures.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner 's name and registered with manufacturer.

#### **1.4 QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

#### **1.6 WARRANTY**

A. Provide five year manufacturer warranty for electric water cooler.

## PART 2 - PRODUCTS

#### 2.1 GENERAL

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.

#### **PART 3 - EXECUTION**

#### 3.1 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

#### 3.2 INSTALLATION

A. Install components level and plumb.

## 3.3 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

#### 3.4 ADJUSTING

#### 3.5 CLEANING

A. Clean plumbing fixtures and equipment.

#### 3.6 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace damaged products before Date of Substantial Completion.

#### END OF SECTION 224000

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## SECTION 230000 COMMON WORK RESULTS FOR HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

## PART 1 – GENERAL

#### 1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with Division 01 General Requirements when available. If not available, the Contractor shall meet the requirements of these specifications.
- B. Where the Owner-Contractor Agreement contradicts this division, the more stringent shall apply.

## 1.2 RELATED REQUIREMENTS

A. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, including state/local building code, mechanical code, plumbing code, electrical code, fire code, and energy code.

#### 1.3 GENERAL

- A. Work included in 23 00 00 applies to Division 23 work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of mechanical systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications, Drawings, Addenda, Owner/ Engineer Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. In the event there is a discrepancy between the drawings, specifications and current code, the more stringent shall apply.
- D. Examine the Drawings, specifications and other Contract Documents relating to the Work and the work of all trades and become fully informed as to the extent and character of work required. Coordinate all work with that of others to ensure proper and complete installation of all materials, equipment and supports.
- E. Intent:
  - 1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete systems, tested and ready for operation (hereinafter "Design Intent").
  - 2. Provide all items not specifically shown on the drawings, called for in the specifications or related Contract Documents, but required to conform to the labor, material and equipment to achieve the Design Intent.
  - 3. Provide all scaffolding, access provisions, tools, appliances, consumables, fees, permits and licenses, debris removal/disposal, supervision and labor, including required start-up, check-out and training to provide complete and fully operable systems in full compliance with the Contract Documents.
  - 4. Before submitting a bid and prior to the start of work, Contractor shall examine all conditions relating to the Work, including that associated with the work of other trades upon which Contractor's work may rely or otherwise depend, to achieve the Design

Intent, in accordance with the best trade practices, workmanship and highest quality product installation, taking into account the sequence of the work, delivery, storage and hoisting requirements, requirements for access, testing and temporary services and all other site limitations and project complexities. Report to the Architect/Engineer any conditions which might prevent installation of materials and/or equipment in the manner intended by the Contract Documents or contrary to applicable codes, standards or regulations.

- 5. By submitting a bid, the Contractor represents that it has made a thorough examination of the site, of the work, including that associated with the work of other trades, all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.
- 6. No consideration or allowance will be granted for any alleged misunderstanding of materials, equipment or components to be furnished or work to be done; it being agreed that tender of proposal carries with it agreement to items, terms and conditions required by the Contract Documents.
- 7. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.
- 8. Site Visit:
  - a. Contractor shall visit the site and verify the exact conditions relating to the work and obtain such information as may be necessary to present a complete and comprehensive bid. No allowance will be made for any extra expense due to Contractor's failure to make such a visit and reasonably verify all actual/existing conditions. In the event of a conflict between existing conditions and the requirements of the Contract Documents, perform the necessary work to conform to Design Intent. The Owner or his representative will be the sole individual to interpret the intent of the Drawings in the event of a conflict between (1) existing conditions and those shown on the drawings, or (2) quality of existing material and quality of material indicated on the drawings or in the specifications. Wherever a conflict such as this occurs, the higher standard shall prevail.

#### Conditions:

- i. Conform to all Bidding Requirements and General Conditions
- ii. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
- iii. Modifications by this Section do not nullify any other portions of the abovereferenced conditions.
- b. Make complete system installation, connecting to all equipment shown on the plans, or called for in the specifications. Contractor to provide any additional extra valves not shown on plans to obtain design criteria as required for a complete system and by the balancing contractor.

Drawings:

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- i. Drawings do not attempt to show all aspects of building construction, which will affect the installation of the systems. The drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, ductwork, etc. shown on the drawings, shall be followed as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural, plumbing and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
- ii. Verify exact distances between points shown on drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements on drawings.
- iii. Changes in design, configuration, or location of equipment, piping, or ductwork, advisable in the opinion of Contractor, shall be submitted to Architect/Engineer for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.
- iv. Check location of all work of all trades and avoid interferences. Conflicts shall be reported to Architect/Engineer for decision and direction. Special attention is called to the following items:
  - a) Exact location of outlets shown on architectural details.
  - b) Location of suspended ceilings.

## 1.4 SPECIAL REQUIREMENTS

- A. When applicable, Contractor acknowledges the ongoing operations of the Owner at or in close proximity to the Project and agrees to coordinate the timing of the Work with the Owner's ongoing operations; perform the Work in a manner that minimizes or eliminates and adverse impact upon the Owner's ongoing operations; confine operations at the site to areas approved by Owner, permitted by law, permits and the Contract Documents; comply with the Owner's standard security, health and safety policies and procedures; not unreasonably encumber the site with any materials or equipment; and not place signs or advertising on or about the site without prior approval of Owner.
- B. Where applicable, all seismic construction, restraints, bracing, mounts and hanging systems shall be in full compliance with the requirements of all Authorities Having Jurisdiction (AHJ's), pre-approval, certification and engineering (including certified engineering calculations and stamps). Contractor shall be solely responsible for obtaining and complying with all requirements of the AHJ.

## 1.5 DEFINITIONS AND ABBREVIATIONS

- A. Finished Spaces: Spaces other than mechanical, plumbing and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical, electrical and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include spaces above hard or lay-in type ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The word "provide," means "furnish and install."
- G. The word "approved," means acceptance by the Architect or Engineer
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect/Engineer, requested by the Architect/Engineer, and similar phrases.

## 1.6 REFERENCE STANDARDS AND GUIDELINES

- A. Include but are not limited to the latest adopted editions from:
  - 1. ADA Americans with Disabilities Act
  - 2. AHRI Air-Conditioning Heating & Refrigeration Institute
  - 3. AMCA Air Moving and Conditioning Association
  - 4. ANSI American National Standards Institute
  - 5. ARI Air Conditioning and Refrigeration Institute
  - 6. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
  - 7. ASME American Society of Mechanical Engineers
  - 8. ASPE American Society of Plumbing Engineers
  - 9. ASSE American Society of Sanitary Engineering
  - 10. ASTM American Society of Testing Materials
  - 11. AWWA American Water Works Association
  - 12. AWS American Welding Society
  - 13. CFR Code of Federal Regulations
  - 14. CISPI Cast Iron Soil Pipe Institute
  - 15. EPA Environmental Protection Agency
  - 16. FM Factory Mutual Engineering Corporation
  - 17. GAMA Gas Appliance Manufacturers Association
  - 18. IAPMO International Association of Plumbing & Mechanical Officials
  - 19. ISO International Organization for Standardization
  - 20. MSS Manufacturers Standardization Society
  - 21. NEBB National Environmental Balancing Bureau

- 22. NEC National Electric Code
- 23. NEMA National Electrical Manufacturers Association
- 24. NFPA National Fire Protection Association
- 25. OSHA Occupational Safety and Health Administration
- 26. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.
- 27. UL Underwriters Laboratories

## 1.7 SCOPE

- A. The work includes, but is not necessarily limited to, the furnishing of all labor, materials, equipment, tools, appliances, hoisting, scaffolding, supervision, for the proper execution and completion of the mechanical work and services necessary for, and reasonably incidental to, providing and installing complete mechanical systems and other work as shown or indicated in the Drawings and Specifications.
- B. The contractor is responsible for a complete and operational system installation. Contractor shall provide all necessary components for a complete and operational system even if such components are not specified or shown in the drawings or specifications. The contractor shall notify the Architect/Engineer of such mission for resolution prior to system installation. All new equipment and products as noted in Part 2 of each section shall be installed as per manufacturer's recommendations.
- C. Provide all additional piping, caps, and valves not shown on drawings, to maintain fully operational systems during the project at no additional cost to the owner.
- D. Consult all other Sections to determine the extent and character of this work specified elsewhere.
- E. Make all connections to equipment requiring service from systems installed under this Section.

## 1.8 SUBMITTALS

- A. Reference Division 1 for submittal requirements when available. If not available, the contractor shall meet the requirements of these specifications.
- B. General
  - 1. Review is for general conformance with the Contract Documents and is not intended to otherwise approve or verify dimensions, quantities, or to coordinate the Work shown on shop drawings on or between Contractor and the work of other trades or Sections. Contractor is solely responsible for quantities, dimensions, means and methods. Dimensions shall be confirmed and correlated by Contractor at the jobsite prior to the start of the Work (procurement, fabrication, construction or other commencement activities). Contractor's failure to fully verify conditions at the jobsite prior to commencement of the work shall not relieve Contractor of its obligations under the Contract Documents and Contractor shall be responsible for all damages caused by or related to its failure to comply with the requirements of this provision.
  - 2. Submittal review shall be performed to show compliance with the design intent. Contractor shall specifically note any deviations from the Contract Documents and explain the reason and nature of the deviation. Such deviations will be reviewed or rejected on the submittal. Deviations not so identified shall not relieve the Contractor from the requirements of the Contract Documents.

- 3. Resubmittals will be reviewed for compliance with comment(s) made on the original submittal only. Architect/Engineer shall not be responsible for changes made upon resubmittal that are not clearly identified (highlighted), and responsive directly to the initial rejection. Resubmittals should not be packaged with non-related first-time submittals, all resubmittals must be marked with the resubmittal number and date and must otherwise comply with all submittal requirements.
- 4. Submit shop drawings, commissioning plan(s) and checklists, penetration locations, supplemental data, etc. as may be required by the Contract Documents for all materials, equipment and other components of the work included in all Sections of this Division and other provisions of the Contract Documents in accordance with the requirements of this Division and referenced sections.
- 5. All submittals must be reviewed by Contractor, and bear Contractors review stamp and signoff for Conformity to the Contract Documents, prior to the submission of any required submittal to Architect/Engineer. Submittals that fail to meet this requirement will be considered incomplete, will not be reviewed by Architect/Engineer and will be returned to Contractor, without review and/or rejected and resubmittal will be required. Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
- 6. Forward all submittals to Architect/Engineer in a coherent, organized fashion, complete and packaged as required herein, Architect/Engineer may reject submittals that fail to comply with this or any other provision of the Contract Documents and Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
- 7. Subject to other provisions of the Contract Documents and in the absence of a more stringent requirement, Architect/Engineer will review a submittal not more than two (2) times. If a submittal is required to be reviewed more than twice due to incomplete, or incorrect information the contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
- 8. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or drawing/detail number, as applicable. In addition, for equipment submittals, include identification numbers appearing on the equipment schedule.
- 9. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.
- 10. Organize submittals in same sequence as they appear in specification sections, articles or paragraphs.
- 11. All materials and equipment submittals shall have a summary sheet at the front complete with catalog numbers. Where materials or equipment pertain to more than one building, submittals shall clearly indicate at which locations the materials or equipment is to be installed.
- 12. Submittals shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping and/or conduit entrance, access requirements for installation and maintenance, physical size and dimension, electrical characteristics and requirements, foundation/curbs and all permanent and temporary support details as well as all information relating to weight, including but not limited to

live and dead weights and other information necessary for component verification and coordination with other trades.

- Submittal Schedule Provide a detailed submittal schedule including all requirements of this Division and its subdivisions to the Architect and Engineer within thirty (30) days of contract award.
  - a. Contractor shall submit for the Engineer's approval a Submittal Schedule for the performance of the work that is consistent with the requirements of the project schedule. The Submittal Schedule shall allow reasonable time for the Architect and other consultants review. If the time for Architects/Engineers review is not otherwise specified, the review period (from date of receipt) shall be a minimum of ten (10) business days. Once approved by the Architect/Engineer, submittal dates and time limits established by the Submittal Schedule shall not, except for reasonable cause, be changed or exceeded by the Contractor.
  - b. For each submittal required by the Contract Documents, the schedule shall include: specification section number, subsection/paragraph identification number, item description (as stated in the applicable specification section, subsection or other Contract Document) and the scheduled delivery date to the Architect/Engineer.
  - c. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project schedule resulting from any deviation to the approved Submittal Schedule, including but not limited to: payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer as may be required to perform out of sequence, stacked, critical, delayed, unscheduled or multiple reviews of required submittals necessitated by rejection of a prior submittal, (cumulatively and hereinafter, "Additional Review Costs")
- 14. Catalog Cuts & Submittal Literature
  - a. Catalog cuts, submittal literature and published material may be included to supplement scale drawings provided that the actual make and model of equipment being submitted on is identified.
  - Submittal literature, drawings and diagrams shall be specifically applicable to this project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item.
- 15. Shop Drawings:
  - a. Shop drawings shall include all significant systems, equipment and components, including but not limited to all equipment, devices, connections and elevations. Include all related specialty rooms (i.e. mechanical, electrical, data/technology). Drawings shall be at a minimum scale of ¼" per 1'-0" and shall be fully coordinated with the work of other trades and/or sections.
  - Identify congested areas and clearly indicate solutions to space problems, developed in conjunction with the work of other trades and/or Sections.
     Identification of space problems without proposed solutions is not acceptable

and is grounds for rejection. For such areas indicate, superimposed, the work of all trades and/or Sections involved and:

- 1. Clearly identify each area of congestion and deviations from the Contract Documents, and:
- 2. Proposed solution(s), clearly documented and signed-off by all other trades and/or Sections involved.
- 16. Anchorage and Supports: Submit details and calculations for support and anchors that are not specifically detailed on the drawings. All calculations must meet current seismic and structural code.
  - a. Provide details and calculations for equipment per local adopted building codes:
    - 1. Having an operating weight over 400 pounds or more and mounted directly to the floor.
    - 2. Having an operating weight over 20 pounds and suspended from the roof, floor, or wall or supported by vibration isolation devices.
  - b. Where pre-approved bracing systems will be employed, submit:
    - 1. System component brochure describing components used and detailed installation instructions.
    - 2. Loads to be transmitted to the structure at anchor points.
  - c. Where anchorage, support, and bracing are not detailed on the drawings, and pre-approved systems are not used, submit details and calculations of proposed systems. Include:
    - 1. Anchorage and Supports
- 1. Where equipment substitutions change the weight, size, configuration, or other aspects of systems and equipment that will affect the performance of anchorages and/or supports, submit calculations for proposed anchors and supports, and install them as shown in these calculations.
- 2. Where substitutions will have no effect on anchors and supports detailed on Contract Documents, submit information on sizes, weights, center of gravity and other relevant information to demonstrate this fact.
  - 17. Shop Fabrication Drawings: Drawings are for the Contractor's use and shall be its responsibility. Do not submit shop fabrication documents unless specifically requested.
  - 18. Testing: Coordinate Shop Drawings to include any additional components for proper system testing.
  - 19. Certificates: Submit final inspection certificates signed by governing authorities.
  - 20. Operating and Maintenance Instructions and Manuals.
    - a. Three (3) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner within ninety (90) days of issuance of final occupancy permit. Each set shall be electronic or permanently bound with a hard cover. The following identification shall be inscribed on the covers, "OPERATING

AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor, and the Contract number. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8 1/2" x 11" with large sheets of Drawings folded in.

- Instructions on major items, including but not limited to: switchgear, generators, pumps, air compressors, boilers, specialty units, fans, air handlers, AC units and temperature controls, shall be by representative of manufacturer of respective equipment.
- c. Submit as identified below and as noted in other specification references.
  - Names, addresses and phone numbers of contractors and subcontractors. List of all system components, with the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.
  - 2. Complete operating and maintenance instructions and parts lists of all equipment and component parts. Data sheets to show all connections, ratings, characteristics, wiring connections, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or failure, and description of operating, test, adjustment, and maintenance procedures.
    - a. Where data sheets included in manual cover equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
- B. Operating Instructions should include, but not be limited to:
  - 1. Normal starting, operational and shutdown procedures, including emergency procedures for each type of equipment/system.
  - 2. Equipment wiring and control diagrams.
  - 3. All other items as may be specified/required by this Section and the Contract Documents.
- C. Maintenance Instructions
  - 1. All items as may be specified/required by this Section and the Contract Documents.
- D. Manufacturers Data (each piece of equipment)
  - 1. Installation instructions
  - 2. Drawings & specifications
  - 3. Parts List, including recommended stock and long lead parts/components.
  - 4. Wiring and riser diagrams.
  - 5. Warranties and guarantees for all equipment, materials and components, including repair, replacement and labor from both Contractor and manufacturer as required by the Contract Documents.

- 6. Certificates of Installation manufacturer's certification of supervision during equipment installation and start-up procedures.
- 7. All other items as may be specified/required by this Section and the Contract Documents.
  - 21. Record Documents.
    - a. Maintain one (1) complete set of prints and specifications at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions, request for information and/or approved change orders. Record locations and depths of buried and concealed system components from fixed, easily identifiable objects, such as building walls or other fixed physical objects. Where systems are concealed in walls or other fixed physical objects, indicate distances from building corners or other building features not likely to be disturbed by fixture alterations.
    - b. Submit Record Drawings within 90 days of system acceptance by owner.
  - 22. Drawings, specifications (as-builts) and approved submittals.
    - a. Where the project uses a BIM model the contractor shall keep the model updated in a similar fashion, maintaining the current project record as described above and submit, an addition to all other requirements of this Section and other provisions of the Contract Documents a complete and accurate BIM model for the project.
    - b. Prior to Substantial Completion, obtain from the Architect a complete set of printed drawings at the Contractor's cost. Record all revisions to these drawings to indicate as-built conditions. Indicate all changes, including RFI's, on this set of documents. Submit one set of blueprints of these revised drawings for review. Make necessary changes and deliver to Architect one set of electronic documents, including any BIM model, upon Final Completion and Acceptance.
    - c. All test reports, certifications, and inspection reports.
    - d. AHJ/Specialty AHJ Approvals (i.e. Fire Marshal and/or Fire Department system approvals).
    - e. Substantial and Final inspection certificate signed by governing authorities.
    - f. All other items as may be specified/required by this Section and/or other provisions of the Contract Documents.

#### 1.8 EQUIPMENT DEVIATIONS AND SUBSTITUTIONS

- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
- B. No substitutions will be allowed and/or considered unless the description of a product includes the phrase "approved equal" and then only upon a determination as to equivalency and impact upon the project budget, schedule and the work of others, including any redesign of the project or its system components by the Architect, Engineer or other trades. The final determination as to sufficiency or acceptance of any such substitution and/or deviation properly requested and submitted by Contractor will lie solely with the Architect/Engineer. Contractor may not implement substitutions that have not been approved by Architect/Engineer.

- C. Unless specified elsewhere in the Contract Documents, a minimum of two (2) weeks shall be allowed for evaluation of any substitution. The burden of all systems re-engineering/design, testing, suitability and constructability is solely placed upon the Contractor for all deviations from the basis of design as reflected in the Contract Documents.
- D. If approved by Architect/Engineer, all such redesign, including all new drawings and detailing required, will be prepared by the Architect/Engineer and their sub-consultants for Change Order documentation for approval by Owner and the Authority Having Jurisdiction will be paid by the Contractor as part of the Deviation Review Costs.
- E. When the Engineer approves a substitution, the approval is given with the understanding that the Contractor guarantees the article or material substituted to be equal to or better in every respect than the article or material specified. The Contractor shall also assume complete responsibility that the article or material will fit the job as far as space, access, and servicing requirements.
- F. Where several materials are specified by name for one use, select for use any of those so specified subject to compliance with specified requirements.
- G. Whenever item or class of material is specified exclusively by detail specification, trade name, manufacturer's name or by catalog reference, use only such item, unless written approval is given. Submit written requests in accordance with these and referenced specifications.
- H. Make no substitutions for materials, articles or process required under contract unless written approval is obtained.

## 1.9 COORDINATION

- A. Prior to construction, coordinate installation and location of systems, devices and equipment with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
- B. Drawings and corresponding electronic media are diagrammatic and indicate the general arrangement of systems and work included in the Work. Consult the drawings, details and other electronic media for locations of fixtures and equipment; where same are not definitely located, obtain this information from the Architect/Engineer.
- C. Take all dimensions from Architectural and Structural Drawings, certified equipment drawings and from the actual field measurements before fabricating work. All conflicts shall immediately be reported to the Architect/Engineer. Contractor is solely responsible for conflicts known or which reasonably should have been know but not reported or resolved before commencement of the work
- D. Coordinate connection of systems with interior/exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- E. Before submitting a bid for the work the Contractor shall visit the site and become familiar with all the work on other related Drawings and Specifications, and plan the work to provide the best possible assembly of the combined work of all trades. No additional costs will be considered for work which has to be relocated due to conflicts with other trades.
- F. If, after examination of the bidding documents relating to the work, the Contractor has queries concerning the nature and scope of the work or intent of the Specifications, he/she shall

promptly request clarification from the Architect/Engineer. After contract award, claims of ignorance of the intent and scope of the contract shall not be allowed.

G. Contractor is responsible for coordinating the schedule of inspections by Engineer at appropriate stages of construction such as rough-in, pre-final, and final, and at other times required by the Specifications or by the construction. Notify Architect and Engineer seven (7) days in advance of proposed site visit. Notification constitutes certification that construction is, or will be, complete and ready for observation. In the event that construction is not ready for observation, contractor shall bear the cost of additional site visits.

#### 1.10 COORDINATION DRAWINGS

- A. Detail major elements, components, systems, equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  - 1. Planned system distribution layout, including specialty device locations and access for operation
  - 2. Clearances for installing and maintaining insulation.
  - 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  - 4. Equipment and accessory service connections and support details.
  - 5. Other systems installed in same space.
  - 6. Exterior wall and foundation penetrations.
  - 7. Fire-rated wall and floor penetrations.
  - 8. Ceiling and wall-mounted access doors and panels required to provide access to operating devices or items needing access for proper maintenance
  - 9. Sizes and location of required concrete pads and bases.
  - 10. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  - 11. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

## 1.11 SEQUENCING AND SCHEDULING

- A. Coordinate equipment installation with other building components.
- B. Arrange for space, chases, slots, and openings in building structure during progress of construction to allow for distribution system installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of all materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Some equipment may require temporary installation during one phase and require relocation to final location under another phase. Provide all associated labor and materials to accommodate this phasing.

- F. Coordinate connection of all systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors if items requiring access are concealed behind finished surfaces. Access panels and doors will be required.

## 1.12 ACCESSIBILITY

- A. Contractor is responsible for verifying that equipment and devices will fit within the space shown on the drawings. Contractor shall locate all equipment which must be serviced, operated or maintained, in fully accessible locations.
- B. Minor deviations from the drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without approval from the Architect/Engineer.

## 1.13 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed shall conform with all local, State, Federal and other applicable laws and regulations.
- B. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- C. Installer Qualifications: Company specializing in performing the work of this section. Company personnel shall be approved by manufacturer for all product installations and required training.
- D. Conform to all applicable standards, codes and regulation and industry best practice requirements.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. All materials and equipment shall be new, shall bear manufacturer's name, and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended. All equipment and components shall include UL label and/or marking on equipment body/device including manufacturer's name, pressure rating(s), electrical classification(s), limits and ratings as applicable to individual components for the purpose specified and intended.
- G. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the Drawings may be furnished, provided such proposed equipment is approved in writing and connecting mechanical and electrical services, such as pipe and/or duct connection sizes, circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. Maintain a minimum duct length of three straight diameters at all fan inlets and outlets. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.
- H. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.

- I. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.
- J. Listing and labeling: Provide motors that are listed and labeled. Terms "listed and labeled": as defined by UL, NEC, Article 100 or other applicable recognized agency as specified in the Contract Documents.
- K. Cutting & Patching: Unless otherwise required by the Contract Documents, Contractor shall be responsible for all cutting, fitting and patching required to complete the Work, or to make portions of the Work and existing conditions fit together properly, and all such areas shall be restored to the conditions existing prior to the cutting, fitting and patching unless otherwise provided in the Contract Documents
- L. Lead Free Requirements: Contractor shall endeavor to use lead free products and where required by law, ordinance, regulation or standard all materials products and practices shall comply with limitations and requirements as to the allowable limits and/or percentages of lead. Lead free products must be certified by and independent 3<sup>rd</sup> party.
  - a. This provision shall apply to any and all similarly regulated materials, products and practices that may be considered hazardous or are otherwise regulated by applicable law, ordinance regulation or standard in the project local.

#### 1.14 DELIVERY, STORAGE, AND HANDLING

- A. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage, and theft. At completion, all work, equipment and materials shall be cleaned, and damage repaired by Contractor. Damaged equipment will be replaced by the contractor if Owner does not accept repairs done to the equipment. Such replacement shall be scheduled to minimize building system interruption of occupied or scheduled for occupancy.
- B. Material delivered at the site shall not be left exposed to the weather or left unattended. Deliver pipes, tubes and conduit with factory-applied end-caps. Contractor shall be responsible to maintain end-caps or provide temporary end caps on all open-ended piping, tubes and conduit through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- C. Protect bright finished shafts, bearing housings and similar items until in service.
- D. Protect plastic pipes and materials from sunlight and support to prevent sagging and bending.
- E. Elevate stored materials above grade. When stored inside, do not exceed structural capacity of the floor.
- F. Provide protective coatings to materials to prevent damage and/or infiltration of moisture and dirt on all materials and equipment including but not limited to cast iron and steel valves.
- G. Contractor shall check the openings in the building and the size of the doors, passages, and openings through which equipment is to be admitted. Wherever necessary, he shall provide the equipment in sections or knocked down in order to admit the equipment through these openings.
- H. Contractor shall provide all rigging, erection and hoisting equipment as required to handle or place equipment and piping in position. This rigging and hoisting equipment shall only be attached and placed on the structure in locations as approved by Architect/Engineer at the site.

#### 1.15 PERMITS AND FEES

- A. Contractor shall arrange and pay for all permits, fees, and inspections required to perform the Work. The Contractor shall present the Owner with properly signed certificates of final inspection before the Work will be accepted.
- B. Contractor shall call for all inspections by local building official(s) when they become due, and shall not cover any work until approved by these governing authorities.
- C. Contractor shall make all arrangements with utility companies for water, steam, gas and drainage services, etc., associated with the work and include required payments for meters, piping, services, connection charges and materials furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

#### 1.16 DOCUMENT OWNERSHIP

A. The Drawings and Specifications, combined with the calculations, field data, notes, and reports, are the intellectual and real property of the Architect and/or Engineer. This covers all forms of written and recorded or electronic media. The reuse of these documents without specific permission of the Architect and Engineer is prohibited. The Drawings may be employed by the Owner and Contractor for the express use of constructing, commissioning and operating the facility only upon proper execution of an Agreement for Use of Electronic Files & Data.

#### 1.17 GUARANTEE AND WARRANTY

- A. Contractor warrants to Owner that the materials and equipment provided under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials and equipment not conforming to these requirements, including substitutions not properly approved by Change Order, shall be considered defective. This warranty excludes remedy for damage caused by improper or insufficient maintenance, improper operation or normal wear, tear and usage. Contractor shall assign to Owner, or otherwise assure the Owner has the full benefit of, all warranties and guarantees of manufacturer, subcontractors, sub-subcontractors and suppliers, and Contractor shall perform the Work in a manner that does not adversely affect or invalidate any available warranties or guarantees.
- B. Contractor shall warrant and guarantee all work against faulty material or workmanship for a period of one (1) year from the date of final completion and written acceptance by the Owner, unless specified more stringently elsewhere in the Contract Documents.
- C. If the project is occupied or the systems placed in operation in several phases at the request of the Owner, the guarantee of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation, tested, commissioned and accepted, in writing, by the Owner. The use of building equipment for temporary service and testing or phases of work completed prior to the projects final completion and acceptance by the Owner does not constitute the commencement of the warranty period.
- D. If a defect or deficiency in the Work is discovered within the one (1) year Warranty & Guarantee period or within such longer period as may be prescribed by the Laws or by any specific guarantee, and Owner elects to have Contractor correct such defect or deficiency, Owner shall notify Contractor of such defect or deficiency in writing. This period of correction

relates only to the specific obligation to correct defects and deficiencies and in no way otherwise limits the Contractor's responsibility for Work that is not in accordance with the Contract Documents, If Contractor fails to timely correct defects or deficiencies in the Work, Owner may, at its sole option, correct them and charge contractor for all cost therefore.

E. Specific exclusions, if any, from this one (1) year warranty and guarantee period are listed in the individual specification sections.

## 1.18 LIMITATIONS OF LIABILITY

- A. To the extent any of the following provisions are not more stringently included in the Contract Document the following Limitations of Liability shall apply:
- B. Architect/Engineer is not responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and is not responsible for Contractor's failure to perform or furnish the work in accordance with the Contract Documents.
- C. In the event that Architect/Engineer's employees or sub-consultants make comments or issue warnings about safety issues, such comments and warnings shall be considered to have been offered by a Good Samaritan and shall not impose any obligation or responsibility.
- D. Engineer will not be responsible for the acts or omissions of Owner, Contractor, any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the portions of the work
- E. Contractor understands and acknowledges that Engineer is not authorized to order extra work or issue Change Orders to the work, however in the event and to the degree that Engineer may offer advice, suggestions, and opinions Contractor shall not rely on such advice, suggestions, and opinions unless directed in writing by Owner or its designated representative, and shall, in no event, make any claim against the Engineer for any such advice, suggestions, and opinions.
- F. To the fullest extent permitted by law, Contractor shall indemnify and hold harmless Architect, Engineer, and their joint ventures, officers, directors, partners, employees and agents from and against any and all claims, costs, loses and damages (including but not limited to all fees and charge of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused in whole or in part by the negligent acts or omissions of Contractor, Contractor's officers, directors, partners, employees, agents; or contractor's subcontractors or material men in the performance of Work. Contractor shall direct its insurer to list Architect, Engineer, and their joint ventures, as Additional Insureds on general liability insurance policies covering this project. Prior to commencing work, Contractor shall submit copies of its certificate of insurance to both Architect and Engineer.

## 1.19 SAFETY

A. Contractors must conduct a weekly safety meeting with their employees and provide documentation as to attendance and topics of discussion. Engineer's construction support services do not constitute review or approval of Contractor's safety procedures. Contractor shall comply with all OSHA regulations. Contractor is required to obtain and pay for insurance required to cover all activities within Contractor's Scope of Work.

## PART 2 – PRODUCTS

#### 2.1 MANUFACTURERS

- A. See Drawings for equipment data, capabilities, and requirements. Manufacturers are identified for the purpose of establishing quality; alternative manufacturers of equal quality are acceptable. If alternative manufacturers are proposed it is the contractor's responsibility to verify and demonstrate the proposed alternative is equivalent.
- B. Provide like items from one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.

#### 2.2 MATERIALS

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by State, County, and City authorities. Provide all materials omitted herein but necessary to complete the work.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. All electrical materials shall bear the label of, or be listed by, the Underwriters' Laboratories (UL), unless the material is of a type for which label or listing service is not provided.
- D. Hazardous Materials: Comply with local, State of Oregon, and Federal regulations relating to hazardous materials. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

#### 2.3 ACCESS PANELS

- A. Confirm Access Panel requirements in individual Division 23 sections. Comply with the following:
- B. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum of 24 x 24 or as required and approved size. Wall access panels to be minimum of 12 x 12 or as required and approved size.

#### 2.4 DRAIN PANS

A. Provide drip pans under all hot water heaters, above-ceiling inline pumps, cooling coils and heat recovery coils. Locate pan immediately below piping and equipment, and extend a minimum of 6" on each side and lengthwise 18" beyond equipment being protected. Pans shall be 2" deep and fabricated from reinforced sheet metal (20 gauge copper or 20 gauge steel with two ounces zinc finish hot dipped after fabrication) with rolled edges and soldered or welded seams. Provide <sup>3</sup>/<sub>4</sub>" copper drainage piping, properly discharged to floor drain, hub drain, or as shown on Drawings. Provide condensate pumps as necessary. Comply with Oregon Mechanical Specialty Code for overflow protection and pipe sizing.

#### 2.5 GUARDS

A. Provide guards in accordance with State Safety Code and OSHA requirements over all rotating equipment including belts, shafts and couplings. Drive guards over belts and sheaves shall include 2-1/2" diameter access opening at shaft ends for speed counter.

#### 2.6 PENETRATION FIRE STOPPING

- A. Through-penetration fire stopping system tested and listed by Underwriters Laboratories.
  3M, Metacaulk, SpecSeal, or approved equivalent.
- B. Select system for proper application based on wall construction, type of penetrating item, wall rating, etc.

## 2.7 MISCELLANEOUS STEEL

- A. Provide all steel as required for adequate support of all mechanical equipment. Use standard angle or channel, I or H sections as required by application. Adequately crossbraced and welded pipe stands may be used for tank supports. Provide suitable base plates for all stands and anchors for all hanging equipment. Drill or burn support holes only in flanges of structural shapes and only in one leg of any one angle, and as far from center of length as possible.
- B. Paint: Apply one coat of black Rustoleum primer to shop fabricated items before delivery to the job; other painting as specified herein.

## PART 3 – EXECUTION

## 3.1 GENERAL MECHANICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of the mechanical systems, materials, and equipment. Comply with the following requirements:
  - 1. Coordinate systems, equipment, and materials installation with other building components.
  - 2. Verify all dimensions by field measurements.
  - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for system installations.
  - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
  - 5. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
  - 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
  - 7. Coordinate connection of systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
  - 8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
  - 9. Install systems, materials, and equipment level and plumb, and parallel or perpendicular to other building systems and components, where installed exposed in finished spaces.

- 10. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- 11. Install access panel or doors where units are concealed behind finished surfaces. Coordinate with other divisions.
- 12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
- 13. Replace all air filters with new filters upon Owner taking occupancy of the building or at a time mutually agreed upon between the Owner and Contractor.
- 14. Do not install ductwork or piping in elevator machine rooms, electrical and/or communication rooms unless it directly services that room.
- B. Locate wall, floor and ceiling fire ratings from architectural drawings for appropriate hourly rating of combination fire/smoke dampers or fire dampers shown on mechanical drawings.

#### 3.2 CONTINUITY OF SERVICE

- A. Contractor, in the performance of the Work shall plan for and incorporate into the work the continuity of services. Where the continuity of service(s) is required to be interrupted Contractor shall plan and schedule the work to minimize interruptions to the facility and its normal operations, prearrange and coordinate all outages/interruptions with Owner's representative, utilities and the work of others. Requests for system interruptions/outages must be submitted at least (5) days prior to intended shutdown time and then subject to Owner's adjustment and/or approval.
- B. For connections that require a significant interruption to facility operations (as determined by the Owner), Contractor shall provide for Owner's written approval a detailed plan, schedule and description of the work for each system interruption. The plan shall include a description and schedule of each work item to be completed, designation of site supervisor and contact information, designated work crew as well as facility access and egress points for materials, manpower and equipment, contingency plan for parts, materials and equipment as well as a program to restore systems in the event of unplanned disruption or inability to complete the work in the timeframe scheduled and approved by Owner. Contractor shall confirm scheduled dates with the Owner and provide a minimum of five (5) days advance notice for each operation.
- C. Where possible and subject to Owners sole discretion, connections to existing systems shall be performed during normal operating conditions. Unless required otherwise (specifications, code, practice, etc.) all tap connections shall be 'live', 'wet' or 'hot''', with the proper safety programs and procedures for isolating system components to ensure the safety of the workforce, occupants and the facility.
- D. Contractor shall include all costs for overtime labor, expedited materials, equipment and contingency planning as necessary to maintain continuity of services, schedule and complete necessary connections. Contractor shall also include provisions for maintaining any and all supplemental systems that may be required to remain in service for the safety, protection and critical operations of the facility and its occupants including but not limited to: Fire Alarm, Security, Phone/Data, BAS, Emergency Power and similarly related critical or emergency systems. Such provisions shall include but not be limited to temporary power, lighting, materials, equipment and/or installations (including removal and cleanup thereof)

required to maintain such systems and as required to safely and properly complete the work.

E. Contractor shall be liable for any and all damages resulting from unscheduled outages/interruptions or for those not confined to the pre-approved timeframes to complete the work.

## 3.3 DEMOLITION

- A. Comply with individual Division 23 sections and the following:
  - 1. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
  - Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
  - 3. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.
  - 4. Unless specifically indicated otherwise on Drawings, remove exposed, unused systems to behind finished surfaces (floor, walls, ceilings, etc.). Cap and patch surfaces to match surrounding finish.
  - 5. Unless specifically indicated otherwise on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).
- B. If duct, pipe, insulation, conduits, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Reuse of Materials: Reuse of materials is prohibited unless specifically indicated or approved by Architect.
- D. Notify Architect in discovery of any hazardous materials.
- E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

#### 3.4 MECHANICAL SYSTEMS - COMMON REQUIREMENTS

- A. General: Install mechanical systems as described below, unless piping Sections specify otherwise. Individual Division 23 Sections specify unique installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of systems. Indicated locations and arrangements were used to size duct and calculate friction loss, fan sizing, and other design considerations. Install ductwork as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install components with pressure rating equal to or greater than system operating pressure.
- D. Install ductwork in concealed interior and exterior locations, except in equipment rooms and service areas.
- E. Install ductwork free of sags and bends.

- F. Install ductwork tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- G. Install ductwork to allow application of insulation plus 1-inch clearance around insulation.
- H. Install flexible connectors according to manufacturer's written instructions, and where indicated and specified in other Division 23 sections.
- I. Install fittings for changes in direction and branch connections.
- J. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe and duct penetrations. Seal pipe and duct penetrations with firestopping materials. If available, refer to Division 7 Section "Firestopping" for materials.
- K. Verify final equipment locations for roughing-in.
- L. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

## 3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.

## 3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

## 3.7 DRAWINGS

- A. The Drawings show the general arrangement and location of the piping and equipment. Work shall be installed in accordance with the Drawings, except for changes required by conflicts with the work of other trades. The Contractor shall provide for the support, expansion, and pitch of any rearranged piping in conformance with the intent of the Drawings, Specifications, and codes.
- B. Note that certain mechanical work is shown, wholly or in part, on Architectural Drawings.
- C. Mechanical Drawings are diagrammatic and are intended to show the approximate location of equipment and ductwork. Dimensions shown on Drawings shall take precedence over scaled dimensions on Drawings. All dimensions shall be verified in the field by the Contractor.
- D. The exact location of apparatus, equipment, and ductwork shall be ascertained from the Owner or the representative in the field, and work shall be laid out accordingly. Should the Contractor fail to ascertain such locations the work shall be changed at Contractor's own expense when so ordered by the Owner. The Engineer and owner reserve the right to make

minor changes in the location of ductwork, piping and equipment up to the time of installation without additional cost.

- E. It is the intention of the Drawings and Specifications that, where certain mechanical items such as unions, expansion joints, and other mechanical components are not shown, but where such items are required by the nature of the work, shall be furnished and installed.
- F. The Mechanical Drawings and Specifications are intended to supplement each other. Any material or labor called for in one shall be furnished even though not specifically mentioned in the other.
- G. Pipe and duct sizes shown are the minimum allowable and shall be increased in size if required by code or wherever necessary to meet unusual conditions.

#### 3.8 DAMAGE

- A. Repair any damage to the building, premises, and equipment occasioned by the work under this Section.
- B. Repair all damage to any part of the building or premises caused by leaks or breaks in pipe, or malfunctions of equipment furnished or installed under this Section until the warranty period expiration date.

# 3.9 ELECTRICAL REQUIREMENTS - CONTROLS AND COORDINATION WITH ELECTRICAL CONTRACTOR

- A. Contractor shall coordinate with the Electrical Contractor on furnishing and installing of controls, motors, starters, etc. Coordinate means informing Electrical Contractor of items requiring electrical connection, providing copies of submittal data, installation data, scheduling work to ensure efficient progress, and promptly supplying those items to be installed by Electrical Contractor.
- B. The specific requirements for electrical power and/or devices for each and every piece of mechanical equipment requiring electrical service, supplied and/or installed under this Contract, shall be coordinated and verified with the Mechanical drawings and specifications, and with the manufacturers of the equipment supplied. This shall include the voltage, phase, and ampacity; conduit requirements; and exact location and type of disconnect, control, and/or connection required. Any changes from the Drawings and Specifications required as a result of this coordination shall be part of this Contract.
- C. Electrical Contractor shall furnish and install the following for all mechanical equipment:
  - 1. Conduit and wiring for line voltage power to the equipment.
  - 2. Disconnect switches.
  - 3. Manual motor starters.
  - 4. Magnetic motor starters when part of a motor control center. See Division 26 and Drawings for further information.
- D. The work under this Section shall include furnishing and installing all controls on low and manual line voltage, including thermostats, auxiliary switches, relay wiring, interlock wiring; equipment control panels and transformers; and controls conduit unless specifically indicated as part of other work. Materials and methods of the control installation shall be in accordance with the Electrical Specifications.

E. The Mechanical Contractor shall review all wiring connections which have any influence on this equipment or work and verify that these connections are correct before permitting any equipment to be operated which is furnished, installed, or modified under this Contract.

## 3.10 ELECTRICAL EQUIPMENT ROOM PRECAUTIONS

A. Ductwork or piping for mechanical systems shall not be installed in any switchgear room, transformer vault, telephone room or electric closet except as indicated. In any case, no ductwork or piping for mechanical systems shall be installed in the space equal to the width and depth of any electrical service equipment, switchboards, panel boards, or motor control centers and extending from the floor to a height of six feet above the equipment or to the structural ceiling, whichever is lower.

## 3.11 CUTTING AND REPAIRING

- A. No cutting shall be done except with approval. Cutting of structural members or footings is prohibited without the prior written consent of the structural engineer.
- B. Where cutting of paving, walls, ceilings, etc. is necessary for the installation of the mechanical work, it shall be done under the direction of this Section. Damage caused by this cutting shall be repaired to match original and adjacent surfaces without additional expense to the Owner. Cutting of new construction shall be by the installing Contractor of that construction as directed by this Contractor.

## 3.12 ACCESSIBILITY

- A. General: Valves, damper operators, filters, thermometers, pressure gauges, clean-out fittings, and indicating equipment or specialties requiring reading, adjusting, inspection, repairing, removal, or replacement shall be conveniently and accessibly located with reference to finished building. Thermometers and gauges installed to be easily read from floor.
- B. Panels: No unions, flanges, valves, dampers, controls, or equipment shall be placed in a location that will be inaccessible after the system is complete. Access panels or doors shall be provided where required whether or not shown on Drawings.
- C. Access Panels in Walls or Ceilings:
  - Provide access panels in walls or ceilings. Milcor or approved equal, where indicated and where required to provide access to valves, dampers, and other appurtenances. Panels shall be style as selected by and as directed by wall or ceiling construction. Panel size shall be 24" x 24" unless indicated otherwise. Panels in acoustical barriers shall have same transmission loss as barrier. Panels in rated construction shall have same rating as construction in which installed.
  - 2. Door panels shall be no lighter than 14 gauge steel. Doors shall be equipped with concealed spring hinges and flush, screwdriver operated locks, except that key operated locks shall be used for all access doors in walls where door is within 6'-0" of floor. Locks for all key operated doors shall be keyed alike.
  - 3. Doors in ceramic tile surfaces shall be stainless steel or chrome plated. Doors in other finished surfaces shall be prime coated.
  - 4. Doors in fire rated grease exhaust duct shafts shall be fire rated and openable without the use of tools.
- D. Equipment Spaces: Provide aisles between equipment and ducts, electrical gear, etc. for complete service and inspection of equipment. Maintain minimum 6'6" headroom in all access

aisles. Maintain minimum 36" clearance at all service panels. Provide minimum clearances at electrical equipment per NEC. Provide 36" wide, 3/4" thick plywood covered catwalks in attics from access door to equipment.

## 3.13 TESTING

A. Test all piping, ductwork, equipment, and systems as called for in the Specifications. Notify and inspection authorities prior to testing so that they may be witnessed. Protect all personnel and equipment during testing. Where Specifications do not cover specific points or methods, conform to manufacturer's specifications.

#### 3.14 OPENINGS

A. Locating and sizing of all openings for pipe, conduit and ductwork through walls, roof, etc. shall be done under this Division. Framing of openings shall be done by the respective trades in whose work the opening is made.

## 3.15 EQUIPMENT

- A. All equipment shall be accurately set and leveled. Supports shall be neatly placed and properly fastened. All equipment shall be fastened in place with bolts.
- B. Keep all openings closed with plugs or caps to prevent entrance of foreign matter. Protect all piping, ductwork, fixtures, and equipment against dirt, water, chemical, or mechanical damage both before and after installation. Any equipment or apparatus damaged prior to final acceptance shall be restored to original condition or replaced at the discretion and at no additional cost to the Owner.
- C. Start-Up: Equipment shall be adjusted, lubricated, aligned, etc. prior to start-up. Inspect each piece of equipment prior to start-up. Start each piece of equipment in accordance with manufacturer's directions and warranty requirements.
- D. Finish: Protect all equipment and materials until in use. Any visible rust or corrosion shall be removed as directed prior to installation. All damaged factory painted finishes shall be cleaned and painted with manufacturer provided paint.

#### 3.16 MANUFACTURER'S DIRECTIONS

- A. Materials and equipment shall be installed in accordance with manufacturer's application and recommendations, requirements, and instructions, and in accordance with Contract Documents. Where manufacturer's instructions differ from those indicated or specified, they shall be brought to attention for resolution prior to equipment ordering and installation.
- B. Where requirements indicated in Contract Documents exceed manufacturer's requirements, Contract Documents shall govern.

## 3.17 FURRING AND PIPE SPACES

- A. Spaces provided in the design of the building shall be utilized and the work shall be kept within the furring lines established on the Drawings.
- B. Layout: Maintain maximum head room under piping and equipment. Contractor to coordinate line locations with beams, windows, etc. to provide maximum clearance. From Drawings, ascertain heights of suspended ceilings and size of pipe shafts in which piping is concealed, and location and size of structural members in and adjacent to pipe shafts. Coordinate piping installation with ductwork, lighting, and other equipment. Ensure necessary clearances on trim plates at exposed penetrations of walls and floors. If sufficient

room is not available above suspended ceiling or vertical shafts obtain clarification from before work is started.

#### 3.18 CLEAN-UP

- A. During the course of work under this Section, all rubbish, debris, surplus materials, tools, etc. resulting from this work shall be removed from work area and shall be disposed of offsite at the end of each working day. The Owner's premises shall be left clean and in a condition acceptable to the owner.
- B. Clean all work installed under this Contract to satisfaction of Owner and submit documentation that each system has been cleaned and results witnessed by the representative.
- C. All water distribution and piping systems, including those for cold water and hot water systems, shall be flushed thoroughly until piping is cleaned to satisfaction of the owner. See other Specification Sections for additional requirements.

## 3.19 ENGRAVED NAMEPLATES

A. Furnish and install plastic laminated engraved nameplates with 1/4" minimum lettering at panel mounted control devices, manual control stations, power disconnects, motor starters and pieces of equipment. Nameplates exposed to weather shall be engraved brass.

#### 3.20 FINAL INSPECTION

A. The Contractor shall furnish the certificates of final inspection and approval from the inspection authorities having jurisdiction.

#### 3.21 SITE VISITS BY ENGINEER

- A. Engineer's responsibility is limited to normal construction support services only, consisting of office consultation, site visits, and reports at appropriate stages of construction such as rough-in, pre-final, and final.
- B. If the Engineer is requested for a site visit and the work performed to that point is not able to be reviewed, requiring an additional site visit, all costs incurred by the Engineer for additional site visits or office shall be paid for by that Contractor.

#### END OF SECTION 23 00 00

## SECTION 23 05 17 SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

## PART 1 – GENERAL

## **1.1 SECTION INCLUDES**

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

## **1.2 REFERENCE STANDARDS**

- A. ASTM C592 Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2016.
- B. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a.

## **1.3 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
  - 1. Minimum three years experience.
- 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.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

#### **1.5 WARRANTY**

- A. See Section 017800 Closeout Submittals, if applicable, for any additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

## PART 2 – PRODUCTS

#### 2.1 PIPE SLEEVES

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
  - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.

- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
  - 3. All Rated Openings: Caulked tight with fire stopping material conforming to ASTM E814 to prevent the spread of fire, smoke, and gases.

## 2.2 MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Manufacturers:
  - 1. Flexicraft Industries; PipeSeal.
  - 2. Or approved equal.
- B. Modular/Mechanical Seal:
  - 1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
  - 2. Provide watertight seal between pipe and wall/casing opening.
  - 3. Elastomer element size and material in accordance with manufacturer's recommendations.
  - 4. Glass reinforced plastic pressure end plates.

## PART 3 – EXECUTION

#### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

#### 3.2 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Structural Considerations: Do not penetrate building structural members unless approved by structural engineer.
- E. Provide sleeves when penetrating footings, floors, walls and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  - 1. Aboveground Piping:
    - a. Pack solid using mineral fiber conforming to ASTM C592.
    - b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.

- 2. All Rated Openings: Caulk tight with fire stopping material conforming to ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
- 3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- F. 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.
- G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

## 3.3 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

## END OF SECTION 23 05 17

## SECTION 23 05 53 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

## PART 1 – GENERAL

#### **1.1 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Stencils.
- E. Pipe markers.
- F. Ceiling tacks.

## **1.2 REFERENCE STANDARDS**

- A. ASME A13.1 Scheme for the Identification of Piping Systems 2015.
- B. ASTM D709 Standard Specification for Laminated Thermosetting Materials 2017.

## **1.3 SUBMITTALS**

- A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- E. Project Record Documents: Record actual locations of tagged valves.

## PART 2 – PRODUCTS

#### 2.1 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Tags.
- C. Automatic Controls: Tags. Key to control schematic.
- D. Control Panels: Nameplates.
- E. Dampers: Ceiling tacks, where located above lay-in ceiling.
- F. Ductwork: Nameplates.
- G. Heat Transfer Equipment: Nameplates.
- H. Instrumentation: Tags.
- I. Major Control Components: Nameplates.
- J. Piping: Tags.
- K. Pumps: Nameplates.

- L. Relays: Tags.
- M. Small-sized Equipment: Tags.
- N. Tanks: Nameplates.
- O. Thermostats: Nameplates.
- P. Valves: Tags and ceiling tacks where located above lay-in ceiling.
- Q. Water Treatment Devices: Nameplates.

## 2.2 NAMEPLATES

- A. Manufacturers:
  - 1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com/#sle.
  - 2. Brimar Industries, Inc: www.pipemarker.com/#sle.
  - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
  - 4. Seton Identification Products, a Tricor Direct Company: www.seton.com/#sle.
- B. Letter Color: White.
- C. Letter Height: 1/4 inch (6 mm).
- D. Background Color: Black.
- E. Plastic: Conform to ASTM D709.

#### 2.3 TAGS

- A. Manufacturers:
  - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com/#sle.
  - 2. Brady Corporation: www.bradycorp.com/#sle.
  - 3. Brimar Industries, Inc: www.pipemarker.com/#sle.
  - 4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
  - 5. Seton Identification Products, a Tricor Company: www.seton.com/#sle.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

## 2.4 ADHESIVE-BACKED DUCT MARKERS

- A. Manufacturers:
  - 1. Brimar Industries, Inc: www.pipemarker.com/#sle.
- B. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch (0.76 mm); printed with UV and chemical resistant inks.
- C. Style: Individual Label.
- D. Color: Yellow/Black.

#### 2.5 STENCILS

A. Manufacturers:

- 1. Brady Corporation: www.bradycorp.com/#sle.
- 2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
- 3. Seton Identification Products, a Tricor Company: www.seton.com/#sle.
- B. Stencils: With clean cut symbols and letters of following size:
  - 1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
  - 2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
  - 3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
  - 4. 8 to 10 inch (200-250 mm) Outside Diameter of Insulation or Pipe: 24 inch (600 mm) long color field, 2-1/2 inch (65 mm) high letters.
  - 5. Over 10 inch (250 mm) Outside Diameter of Insulation or Pipe: 32 inch (800 mm) long color field, 3-1/2 inch (90 mm) high letters.
  - 6. Ductwork and Equipment: 2-1/2 inch (65 mm) high letters.
- C. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

#### 2.6 PIPE MARKERS

- A. Manufacturers:
  - 1. Brady Corporation: www.bradycorp.com/#sle.
  - 2. Brimar Industries, Inc: www.pipemarker.com/#sle.
  - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
  - 4. MIFAB, Inc: www.mifab.com/#sle.
- B. Color: Conform to 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. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.
- F. Color code as follows:
  - 1. Heating, Cooling, and Boiler Feedwater: Green with white letters.
  - 2. Toxic and Corrosive Fluids: Orange with black letters.
  - 3. Compressed Air: Blue with white letters.

## 2.7 CEILING TACKS

- A. Manufacturers:
  - 1. Craftmark: www.craftmarkid.com/#sle.
- B. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- C. Color code as follows:
  - 1. HVAC Equipment: Yellow.
  - 2. Fire Dampers and Smoke Dampers: Red.
  - 3. Heating/Cooling Valves: Blue.

### PART 3 – EXECUTION

### 3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

#### 3.2 INSTALLATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.
- D. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- E. Install tags with corrosion resistant chain.
- F. Install plastic pipe markers in accordance with manufacturer's instructions.
- G. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- H. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- I. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
  - 1. Identify service, flow direction, and pressure.
  - 2. Install in clear view and align with axis of piping.
  - 3. Locate identification not to exceed 20 feet (6 m) 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.
- J. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- K. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

#### END OF SECTION 23 05 53

### SECTION 23 0593 TESTING, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 - GENERAL

### **1.1 SECTION INCLUDES**

- A. Testing, adjusting, and balancing of air systems specified in Division 23.
- B. Work shall generally consist of volume adjustments, speed adjustments, performing tests, recording equipment data and measurements, and preparing reports to achieve system performance as required by Contract Documents.
- C. Where work involves modification of existing systems, the Contractor shall perform testing adjusting, and balancing of all related equipment and systems required to achieve system performance shown on Drawings and as specified. This includes interrelated equipment and systems which are not modified, but where testing, adjusting, and balancing is required to achieve overall system performance.

# **1.2 DEFINITIONS**

- A. AABC: Associated Air Balance Council.
- B. BAS: Building Automation System. Automatic control system consisting of standalone or integrated digital controllers used to control HVAC equipment.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. Project Supervisor: Individual employed by balancing contractor having administrative and technical responsibility for work performed under this Section.

# **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.
- 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. Special Requirements:
  - 1. Contractor Qualifications: Submit documentation within 14 days of the Contract Date demonstrating that TAB Contractor and Project Supervisor are NEBB certified.
  - 2. Pre-balancing Submittal: Provide submittal 30 days after approval of contractor's qualifications including:
    - a. Preliminary TAB report including report documentation form with design data and existing equipment data listed.
    - b. Description of balancing tolerances which are in accordance with NEBB standards.
    - c. Review Contract Documents and provide list of provisions that are not included but necessary to complete work such as balancing dampers, valves, flow measuring stations, test plugs, access doors, etc.

- d. Review Contract Documents and provide a description of any conditions that are unclear, contradictory, or otherwise may prevent specified systems from achieving design performance.
- e. Provide a written description of test procedures that are unique to this project and not specified by NEBB standards.
- 3. Draft Balancing Report: When balancing is complete in whole or for any major phase of work, provide draft balancing report to Engineer for review. Engineer shall provide written review comments to Balancing Contractor. Balancing report shall include information and data providing an exact record of system performance, documenting compliance with specification requirements, and enabling independent verification of all measurements. Reports shall include notes and comments necessary to clearly communicate balancing results. Report contents shall include the following information:
  - a. NEBB certification
  - b. Identification of all test instruments used and the last calibration dates.
  - c. Plans or schematic diagram showing the location of equipment, measurement locations, and terminal devices. Plans shall show equipment and terminal device designation corresponding to report forms.
  - d. Testing and balancing documentation recorded on NEBB report forms. Each report form shall include the name of individual performing TAB work. Forms shall be fully completed with all relevant data entered.
  - e. Summary of minimum outside air ventilation measurements and adjustments.
  - f. Summary of all conditions which are not in conformance with Contract Documents.
  - g. Copy of written directives from the Engineer and other relevant project correspondence.
- B. Final Balancing Report: Provide electronic certified copies of final balancing report bearing seal of Project Supervisor. Update draft balancing report responding to draft report review comments.

# **1.5 QUALITY ASSURANCE**

- A. Balancing Contractor and Project Supervisor shall be certified by NEBB.
- B. Balancing Contractor must be approved prior to bid closing. Unless Balancing Contractor is listed as pre-approved below, Bidder must submit a request for approval, in writing, to the Engineer. The request must include documentation, including references, that demonstrates that the Balancing Contractor has the necessary training and experience to perform the Work specified. Approval determinations will be made by the Engineer. In addition to documentation provided by the Bidder, the Engineer may use any information available to him in determining qualifications/suitability of the Balancing Contractor.
- C. Pre-approved contractors: Air Balancing Specialties; Air Introduction & Regulation; Neudorfer Engineers.
- D. All work under this Section shall be performed under the direction of the Project Supervisor.
- E. Balancing Contractor shall attend a pre-balancing coordination meeting with the Owner's Authorized Representative, Engineer, and Contractor. Meeting agenda shall include: coordination of work between Balancing Contractor and Control Contractor, balancing procedures, and schedule of work. Meeting shall be attended by Project Supervisor.

### PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Test Instruments: Furnished by Contractor.
- B. Plugs: Provide plastic plugs in test holes drilled in ductwork. Provide UV resistant plugs for equipment located outdoors.

### PART 3 - EXECUTION

### 3.1 GENERAL REQUIREMENTS

- A. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- B. 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.
- C. TAB Agency Qualifications:
  - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  - 2. Having minimum of three years documented experience.
  - 3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau.
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### **3.2 EXAMINATION**

- A. Examine Contract Documents for testing and balancing devices that are not included but necessary to complete work such as balancing dampers, valves, flow measuring stations, test plugs, access doors, etc. Submit list of recommended additional devices needed to perform work.
- B. Examine Contract Documents for any conditions that are unclear, contradictory, or otherwise may prevent specified systems from achieving design performance. Submit list of conditions observed.
- C. 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.
- D. 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 5 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, maintaining overall pressurization (positive, negative or neutral) per plan in each room.

### 3.4 APPLICATION

- A. Work shall be performed in accordance with the latest addition of the NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- B. Accuracy of measurements and balancing tolerances shall be in accordance with NEBB standards.
- C. Special Balancing Procedures
  - 1. Motors: Record starter overload settings. List overload part number and rating for bimetallic overloads or setpoint for adjustable overload devices.
  - 2. Mark final position of balancing devices after balancing is complete.
- D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- H. Check and adjust systems approximately six months after final acceptance and submit report.
- I. BAS Calibration and Testing
  - 1. Perform tests as required to determine BAS control setpoints and control parameters including but not limited to:

- a. Minimum outside air ventilation parameters to achieve minimum ventilation rates as specified and as shown on Drawings.
- b. Minimum pressure setpoints for variable volume air or water system speed control required to meet peak load conditions.
- c. Provide a summary report of final BAS control setpoints and parameters in report.
- 2. Perform field verification and calibration of BAS airflow and water flow transmitters.
  - a. Airflow verification shall be performed by duct traverse in straight section of ductwork to provide measurement accuracy of +/- 5% or better.
  - b. Provide a summary report of final BAS calibration parameters in report.
- 3. Perform tests as required to determine calibration parameters for terminal unit flow measurement. Test at maximum, minimum, and zero flow. Provide a summary report of terminal unit calibration tests and BAS parameters in report.
- J. Balancing is complete when following conditions are achieved:
  - 1. Systems and components are tested and balanced within specified tolerances.
  - 2. All efforts within the extent of TAB have been exhausted, and systems or components are not operating within acceptable tolerances. Balancing is not complete until written notification of all abnormal or deficient conditions is provided to the Engineer, written direction is received, and all work required by Contract Documents is fully completed.

#### 3.5 FIELD QUALITY CONTROL

A. Testing instruments shall be reliable, accurate, and in good working order. Calibration maintenance of all instruments shall be in accordance with NEBB requirements.

## END OF SECTION 23 05 93

SECTION 23 07 13 DUCT INSULATION

### PART 1 – GENERAL

### **1.1 SECTION INCLUDES**

- A. Duct insulation.
- B. Duct liner.
- C. Insulation jackets.

### **1.2 RELATED REQUIREMENTS**

- A. Section 230553 Identification for HVAC Piping and Equipment.
- B. Section 233100 HVAC Ducts and Casings: Glass fiber ducts.

### **1.3 REFERENCE STANDARDS**

- A. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- B. ASTM B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- C. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
- D. ASTM C534/C534M Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2016.
- E. ASTM C553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013.
- F. ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014.
- G. ASTM C916 Standard Specification for Adhesives for Duct Thermal Insulation 2014.
- H. ASTM C1071 Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2016.
- I. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.
- J. ASTM E96/E96M Standard Test Methods for Water Vapor Transmission of Materials 2016.
- K. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015.
- L. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- M. UL 723 Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

### **1.4 SUBMITTALS**

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

### **1.7 FIELD CONDITIONS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

# PART 2 – PRODUCTS

### 2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### 2.2 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
  - 1. Johns Manville: www.jm.com.
  - 2. Knauf Insulation; Atmosphere Duct Wrap: www.knaufinsulation.com.
  - 3. Owens Corning Corporation: www.ocbuildingspec.com.
  - 4. CertainTeed Corporation: www.certainteed.com.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. 'K' ('Ksi') value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
  - 3. 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. Outdoor Vapor Barrier Mastic:
  - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- F. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter (1.29 mm diameter).

# 2.3 GLASS FIBER, RIGID

- A. Manufacturer:
  - 1. Johns Manville: www.jm.com.
  - 2. Knauf Insulation: www.knaufinsulation.com.
  - 3. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: www.ocbuildingspec.com.
  - 4. CertainTeed Corporation: www.certainteed.com.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
  - 1. 'K' ('Ksi') Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
  - 3. 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. Indoor Vapor Barrier Finish:
  - 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
  - 2. Vinyl emulsion type acrylic, compatible with insulation, black color.

# 2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturer:
  - 1. Armacell LLC: www.armacell.us.
  - 2. K-Flex USA LLC; Insul-Sheet: www.kflexusa.com.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
  - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
  - 2. Maximum Service Temperature: 180 degrees F (82 degrees C).
  - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

# 2.5 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
  - 1. Lagging Adhesive:

- a. Compatible with insulation.
- B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square (2.45 kg/sq m).
- C. Aluminum Jacket: ASTM B209 (ASTM B209M).
  - 1. Thickness: 0.016 inch (0.40 mm) sheet.
  - 2. Finish: Smooth.
  - 3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
  - 4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
  - 5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.
  - 6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

### 2.6 DUCT LINER

- A. Manufacturers:
  - 1. Armacell LLC; AP Coilflex: www.armacell.us.
  - 2. Johns Manville: www.jm.com.
  - 3. Knauf Insulation: www.knaufinsulation.com.
  - 4. Owens Corning Corporation: www.ocbuildingspec.com.
  - 5. CertainTeed Corporation: www.certainteed.com.
- B. Note: Choose the liner type Elastomeric Foam or Glass Fiber.
- C. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
  - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
  - 2. Maximum Service Temperature: 180 degrees F (82 degrees C).
  - 3. Fungal Resistance: No growth when tested according to ASTM G21.
  - Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F (0.045 at 24 degrees C).
  - 5. Erosion Resistance: Does not show evidence of breaking away, flaking off, or delamination at velocities of 10,000 fpm (50.8 m/s) per ASTM C1071.
  - 6. Connection: Waterproof vapor barrier adhesive.
- D. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer or black composite.
  - 1. Fungal Resistance: No growth when tested according to ASTM G21.
  - Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F (0.045 at 24 degrees C).
  - 3. Service Temperature: Up to 250 degrees F (121 degrees C).
  - 4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm (25.4 m/s), minimum.
- E. Adhesive: Waterproof, fire-retardant type, ASTM C916.
- F. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

# PART 3 – EXECUTION

### **3.1 EXAMINATION**

- A. Verify that ducts have been tested before 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. Insulated ducts conveying air below ambient temperature:
  - 1. Provide insulation with vapor barrier jackets.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ducts conveying air above ambient temperature:
  - 1. Provide with or without standard vapor barrier jacket.
  - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. 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.

### 3.3 SCHEDULES

- A. Insulation R-values shall comply with currently adopted version of ASHRAE 90.1.
- B. Supply and Return Ducts:
  - 1. Exterior Locations (includes attics above insulated ceilings, crawl spaces and parking garages): R-12 minimum.
  - 2. Unconditioned Spaces: R-6 minimum.

SECTION 23 31 00 HVAC DUCTS AND CASINGS

### PART 1 GENERAL

#### **1.1 SECTION INCLUDES**

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Casing and plenums.
- D. Duct cleaning.

#### **1.2 RELATED REQUIREMENTS**

- A. Section 230593 Testing, Adjusting, and Balancing for HVAC.
- B. Section 230713 Duct Insulation: External insulation and duct liner.
- C. Section 233300 Air Duct Accessories.
- D. Section 233700 Air Outlets and Inlets.

#### **1.3 REFERENCE STANDARDS**

- A. ASHRAE (FUND) ASHRAE Handbook Fundamentals Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A36/A36M Standard Specification for Carbon Structural Steel 2014.
- C. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.
- D. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- E. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- F. ASTM B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- G. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.
- H. ICC-ES AC01 Acceptance Criteria for Expansion Anchors in Masonry Elements 2015.
- I. ICC-ES AC106 Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.
- J. ICC-ES AC193 Acceptance Criteria for Mechanical Anchors in Concrete Elements 2015.
- K. ICC-ES AC308 Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.
- L. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- M. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- N. SMACNA (LEAK) HVAC Air Duct Leakage Test Manual 2012.
- O. UL 181 Standard for Factory-Made Air Ducts and Air Connectors current edition, including all revisions.

# 1.4 SUBMITTALS

- A. Product Data: Provide data for duct materials.
- B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).
- C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience.

#### **1.6 FIELD CONDITIONS**

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

### PART 2 – PRODUCTS

#### 2.1 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply: 2 inch w.g. (500 Pa) pressure class, galvanized steel.
- D. Return and Relief: 1 inch w.g. (250 Pa) pressure class, galvanized steel.
- E. General Exhaust: 1 inch w.g. (250 Pa) pressure class, galvanized steel.
- F. Kitchen Cooking Hood Exhaust: 1 inch w.g. (250 Pa) pressure class, galvanized steel.
- G. Outside Air Intake: 1 inch w.g. (250 Pa) pressure class, galvanized steel.

### 2.2 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.
- C. Stainless Steel for Ducts: ASTM A666, Type 304.
- D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
  - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
  - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
  - 3. For Use with Flexible Ducts: UL labeled.

- E. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- F. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
  - 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

## 2.3 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated. Minimum thickness shall be 26 gauge.
- 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).

# 2.4 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flat Oval Ducts: Machine made from round spiral lockseam duct.
  - 1. Manufacture in accordance with SMACNA (DCS).
  - 2. Fittings: Manufacture at least two gages heavier metal than duct.
  - 3. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Spiral Ducts: Round spiral lockseam duct with galvanized steel outer wall.
  - 1. Manufacture in accordance with SMACNA (DCS).
- C. Round Ducts: Round lockseam duct with galvanized steel outer wall.
  - 1. Manufacture in accordance with SMACNA (DCS).
- D. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
  - 1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  - Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
  - 3. Maximum Velocity: 4000 fpm (20.3 m/sec).
  - 4. Temperature Range: Minus 10 degrees F to 160 degrees F (Minus 23 degrees C to 71 degrees C).

### 2.5 CASINGS

A. Fabricate casings in accordance with SMACNA (DCS) and construct for operating pressures indicated.

- B. Mount floor mounted casings on 4 inch (100 mm) high concrete curbs. At floor, rivet panels on 8 inch (200 mm) centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gage, 0.0478 inch (1.21 mm) expanded metal mesh supported at 12 inch (300 mm) centers, turned up 12 inches (300 mm) at sides with sheet metal shields.
- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

### PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Flexible Ducts: Connect to metal ducts with adhesive.
- D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- I. At exterior wall louvers, seal duct to louver frame.
- J. Grease duct shall be installed in accordance with all code requirements. Provide cleanouts where required. Slope horizontal ducts down toward hood at a minimum of 1/4" per foot of run. Provide required clearances to combustibles.

### 3.2 CLEANING

A. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

### END OF SECTION 23 31 00

### SECTION 23 33 00

**AIR DUCT ACCESSORIES** 

## PART 1 – GENERAL

# **1.1 SECTION INCLUDES**

- A. Backdraft dampers metal.
- B. Duct access doors.
- C. Duct test holes.
- D. Flexible duct connections.
- E. Volume control dampers.

### 1.2 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts and Casings.

### **1.3 REFERENCE STANDARDS**

- A. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- B. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

### **1.4 SUBMITTALS**

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- B. Project Record Drawings: Record actual locations of access doors and test holes.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

# PART 2 – PRODUCTS

### 2.1 BACKDRAFT DAMPERS - METAL

- A. Manufacturers:
  - 1. Nailor Industries, Inc: www.nailor.com.
  - 2. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
  - 3. Greenheck.
- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch (150 mm) 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.

### 2.2 DUCT ACCESS DOORS

- A. Manufacturers:
  - 1. Nailor Industries, Inc: www.nailor.com.
  - 2. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.

### 2.3 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.

### 2.4 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
  - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
- C. Maximum Installed Length: 60 inch.

### 2.5 VOLUME CONTROL DAMPERS

- A. Manufacturers:
  - 1. Nailor Industries, Inc: www.nailor.com.
  - 2. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
  - 3. Greenheck.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Single Blade Dampers:
  - 1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
  - 2. Blade: 24 gage, 0.0239 inch (0.61 mm), minimum.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- E. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

# PART 3 – EXECUTION

### 3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

### 3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

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- C. Provide duct test holes where required for testing and balancing purposes.
- D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- E. At equipment supported by vibration isolators, 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 23 33 00

### SECTION 23 37 00

### AIR OUTLETS AND INLETS

#### PART 1 - GENERAL

#### **1.1 SECTION INCLUDES**

- A. Grilles, Registers, Diffusers.
- B. Louvers.

#### **1.2 REFERENCE STANDARDS**

- A. AMCA 511 Certified Ratings Program for Air Control Devices 2010.
- B. AMCA 550 Test Method for High Velocity Wind Driven Rain Resistant Louvers 2015.
- C. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.
- D. ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.
- E. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- F. SMACNA (ASMM) Architectural Sheet Metal Manual 2012.
- G. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

### **1.3 SUBMITTALS**

- A. 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.
- B. Project Record Documents: Record actual locations of air outlets and inlets.

### **1.4 QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.

### PART 2 – PRODUCTS

#### 2.1 GRILLES, REGISTERS, DIFFUSERS

- A. Manufacturers:
  - 1. Krueger-HVAC, Division of Air System Components: www.krueger-hvac.com.
  - 2. Price Industries: www.price-hvac.com.
  - 3. Titus, a brand of Air Distribution Technologies: <u>www.titus-hvac.com</u>.
  - 4. Nailor.
  - 5. Shoemaker.

### 2.2 LOUVERS

A. Manufacturers:

- 1. Greenheck.
- 2. Ruskin.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air-tight connection.
- E. 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, or whether shown on Drawings.

### END OF SECTION 23 37 00

### SECTION 26 00 00 - COMMON WORK RESULTS FOR ELECTRICAL

#### PART 1 - GENERAL

#### 1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with Division 01 General Requirements when available. If not available, the contractor shall meet the requirements of these specifications.
- B. Where the Owner-Contractor Agreement contradicts this division, the more stringent shall apply.

#### 1.2 RELATED REQUIREMENTS

A. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. Comply with all current Federal, State, and local codes, standards and ordinances including all referenced standards and amendments:

- · 2019 Oregon Building Code
- · 2019 Oregon Fire Code
- · 2019 Oregon Energy Code
- · 2019 Oregon Green Buildings Standards Code
- · 2019 Oregon Mechanical Code
- · 2019 Oregon Plumbing Code
- · 2019 Oregon Electrical Code (2014 NEC Amended)
- · 2019 Oregon Access Compliance Reference Manual
- Americans with Disabilities Act Standards for Accessible Design
- OSHA, NPFA, utility company standards and all other codes and standards referenced by the above documents.

#### 1.3 GENERAL

- A. Work included in 26 00 00 applies to Division 26 work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of the electrical systems for proposed project.
- B. Division 01 General Requirements are hereby a part of this Section as fully as if repeated herein.

- C. Contract Documents include, but are not limited to, Specifications, Drawings, Addenda, Owner/Engineer Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- D. In the event there is a discrepancy between the drawings, specifications and current code, the more stringent shall apply.
- E. Examine the Drawings, specifications and other Contract Documents relating to the Work and the work of all trades and become fully informed as to the extent and character of work required. Coordinate all work with that of others to ensure proper and complete installation of all materials, equipment and supports.
- F. Intent:
  - 1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete electrical systems, tested and ready for operation (hereinafter "Design Intent").
  - 2. Provide all items not specifically shown on the drawings, called for in the specifications or related Contract Documents, but required to conform to the labor, material and equipment to achieve the Design Intent.
  - 3. Provide all scaffolding, access provisions, tools, appliances, consumables, fees, permits and licenses, debris removal/disposal, supervision and labor, including required start-up, check-out and training to provide complete and fully operable systems in full compliance with the Contract Documents.
  - 4. Before submitting a bid and prior to the start of work, Contractor shall examine all conditions relating to the Work, including that associated with the work of other trades upon which Contractor's work may rely or otherwise depend, to achieve the Design Intent, in accordance with the best trade practices, workmanship and highest quality product installation, taking into account the sequence of the work, delivery, storage and hoisting requirements, requirements for access, testing and temporary services and all other site limitations and project complexities. Report to the Architect/Engineer any conditions which might prevent installation of materials and/or equipment in the manner intended by the Contract Documents or contrary to applicable codes, standards or regulations.
  - 5. By submitting a bid, the Contractor represents that it has made a thorough examination of the site, of the work, including that associated with the work of other trades, all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.
  - 6. No consideration or allowance will be granted for any alleged misunderstanding of materials, equipment or components to be furnished or work to be done; it being agreed that tender of proposal carries with it agreement to items, terms and conditions required by the Contract Documents.
  - 7. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the

Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.

- G. Site Visit:
  - 1. Contractor shall visit the site and verify the exact conditions relating to the work and obtain such information as may be necessary to present a complete and comprehensive bid. No allowance will be made for any extra expense due to Contractor's failure to make such a visit and reasonably verify all actual/existing conditions. In the event of a conflict between existing conditions and the requirements of the Contract Documents, perform the necessary work to conform to Design Intent. The Owner or his representative will be the sole individual to interpret the intent of the Drawings in the event of a conflict between (1) existing conditions and those shown on the drawings, or (2) quality of existing material and quality of material indicated on the drawings or in the specifications. Wherever a conflict such as this occurs, the higher standard shall prevail.
- H. Conditions:
  - 1. Conform to all Bidding Requirements and General Conditions.
  - 2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
  - 3. Modifications by this Section do not nullify any other portions of the above-referenced conditions.
- I. Make complete system installation, connecting to all equipment shown on the plans, or called for in the specifications. Contractor to provide any additional extra devices not shown on plans to obtain design criteria as required for a complete electrical system.
- J. Drawings:
  - 1. Drawings do not attempt to show all aspects of building construction, which will affect the installation of electrical systems. The electrical drawings are diagrammatic and do not intend to show all components necessary for a complete installation. Locations of equipment, and devices. shown on the drawings, shall be followed as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural, mechanical and plumbing drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
  - 2. Verify exact distances between points shown on drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements on drawings.
  - 3. Changes in design, configuration, or location of equipment, conduit or cable tray in the opinion of Contractor, shall be submitted to Architect/Engineer for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.

- 4. Check location of all work of all trades and avoid interferences. Conflicts shall be reported to Architect/Engineer for decision and direction. Special attention is called to the following items:
  - a. Exact location of outlets shown on architectural details.
  - b. Location of suspended ceilings.

#### 1.4 SPECIAL REQUIREMENTS

- A. When applicable, Contractor acknowledges the ongoing operations of the Owner at or in close proximity to the Project and agrees to coordinate the timing of the Work with the Owner's ongoing operations; perform the Work in a manner that minimizes or eliminates and adverse impact upon the Owner's ongoing operations; confine operations at the site to areas approved by Owner, permitted by law, permits and the Contract Documents; comply with the Owner's standard security, health and safety policies and procedures; not unreasonably encumber the site with any materials or equipment; and not place signs or advertising on or about the site without prior approval of Owner.
- B. Where applicable, all seismic construction, restraints, bracing, mounts and hanging systems shall be in full compliance with the requirements of all Authorities Having Jurisdiction (AHJ's), pre-approval, certification and engineering (including certified engineering calculations and stamps). Contractor shall be solely responsible for obtaining and complying with all requirements of the AHJ.

### 1.5 DEFINITIONS AND ABBREVIATIONS

- A. Finished Spaces: Spaces other than mechanical, plumbing and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical, electrical and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include spaces above hard or lay-in type ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The word "provide," means "furnish and install."
- G. The word "approved," means acceptance by the Architect or Engineer.
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.

I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect/Engineer, requested by the Architect/Engineer, and similar phrases.

#### 1.6 REFERENCE STANDARDS AND GUIDELINES

- A. Include but are not limited to the latest adopted editions from:
  - 1. ADA Americans with Disabilities Act
  - 2. AHRI Air-Conditioning Heating & Refrigeration Institute
  - 3. AMCA Air Moving and Conditioning Association
  - 4. ANSI American National Standards Institute
  - 5. ARI Air Conditioning and Refrigeration Institute
  - 6. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
  - 7. ASME American Society of Mechanical Engineers
  - 8. ASPE American Society of Plumbing Engineers
  - 9. ASSE American Society of Sanitary Engineering
  - 10. ASTM American Society of Testing Materials
  - 11. AWWA American Water Works Association
  - 12. AWS American Welding Society
  - 13. CFR Code of Federal Regulations
  - 14. CISPI Cast Iron Soil Pipe Institute
  - 15. EPA Environmental Protection Agency
  - 16. FM Factory Mutual Engineering Corporation
  - 17. GAMA Gas Appliance Manufacturers Association
  - 18. IAPMO International Association of Plumbing & Mechanical Officials
  - 19. ISO International Organization for Standardization
  - 20. MSS Manufacturers Standardization Society
  - 21. NEBB National Environmental Balancing Bureau
  - 22. NEC National Electric Code
  - 23. NEMA National Electrical Manufacturers Association
  - 24. NFPA National Fire Protection Association
  - 25. OSHA Occupational Safety and Health Administration
  - 26. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.
  - 27. UL Underwriters Laboratories
- 1.7 SCOPE

- A. The work includes, but is not necessarily limited to, the furnishing of all labor, materials, equipment, tools, appliances, hoisting, scaffolding, supervision, for the proper execution and completion of the electrical work and services necessary for, and reasonably incidental to, providing and installing complete systems, and other electrical work as shown or indicated in the Drawings and Specifications.
- B. The contractor is responsible for a complete and operational system installation. Contractor shall provide all necessary components for a complete and operational system even if such components are not specified or shown in the drawings or specifications. The contractor shall notify the Architect/Engineer of such mission for resolution prior to system installation. All new equipment and products as noted in Part 2 of each section shall be installed as per manufacturer's recommendations.
- C. Provide all additional devices not shown on drawings, to maintain fully operational systems during the project at no additional cost to the owner.
- D. Consult all other Sections to determine the extent and character of this work specified else where.
- E. Make all connections to equipment requiring service from systems installed under this Section.

# 1.8 SUBMITTALS

- A. Reference Division 1 for submittal requirements when available. If not available the contractor shall meet the requirements of these specifications.
- B. General
  - Review is for general conformance with the Contract Documents and is not intended to otherwise approve or verify dimensions, quantities, or to coordinate the Work shown on shop drawings on or between Contractor and the work of other trades or Sections. Contractor is solely responsible for quantities, dimensions, means and methods. Dimensions shall be confirmed and correlated by Contractor at the jobsite prior to the start of the Work (procurement, fabrication, construction or other commencement activities). Contractor's failure to fully verify conditions at the jobsite prior to commencement of the work shall not relieve Contractor of its obligations under the Contract Documents and Contractor shall be responsible for all damages caused by or related to its failure to comply with the requirements of this provision.
  - 2. Submittal review shall be performed to show compliance with the design intent. Contractor shall specifically note any deviations from the Contract Documents and explain the reason and nature of the deviation. Such deviations will be reviewed or rejected on the submittal. Deviations not so identified shall not relieve the Contractor from the requirements of the Contract Documents.
  - 3. Resubmittals will be reviewed for compliance with comment(s) made on the original submittal only. Architect/Engineer shall not be responsible for changes made upon resubmittal that are not clearly identified (highlighted), and responsive directly to the initial rejection. Resubmittals should not be packaged with non-related first-time submittals, all resubmittals must be marked with the resubmittal number and date and must otherwise comply with all submittal requirements.

- 4. Submit shop drawings, commissioning plan(s) and checklists, penetration locations, supplemental data, etc. as may be required by the Contract Documents for all materials, equipment and other components of the work included in all Sections of this Division and other provisions of the Contract Documents in accordance with the requirements of this Division and referenced sections.
- 5. All submittals must be reviewed by Contractor, and bear Contractors review stamp and signoff for Conformity to the Contract Documents, prior to the submission of any required submittal to Architect/Engineer. Submittals that fail to meet this requirement will be considered incomplete, will not be reviewed by Architect/Engineer and will be returned to Contractor, without review and/or rejected and resubmittal will be required. Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
- 6. Forward all submittals to Architect/Engineer in a coherent, organized fashion, complete and packaged as required herein, Architect/Engineer may reject submittals that fail to comply with this or any other provision of the Contract Documents and Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
- 7. Subject to other provisions of the Contract Documents and in the absence of a more stringent requirement, Architect/Engineer will review a submittal not more than two (2) times. If a submittal is required to be reviewed more than twice due to incomplete, or incorrect information the contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
- 8. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or drawing/detail number, as applicable. In addition, for equipment submittals, include identification numbers appearing on the equipment schedule.
- 9. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.
- 10. Organize submittals in same sequence as they appear in specification sections, articles or paragraphs.
- 11. All materials and equipment submittals shall have a summary sheet at the front complete with catalog numbers. Where materials or equipment pertain to more than one building, submittals shall clearly indicate at which locations the materials or equipment is to be installed.
- 12. Submittals shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping and/or conduit entrance, access requirements for installation and maintenance, physical size and dimension, electrical characteristics and requirements, foundation/curbs and all permanent and temporary support details as well as all information relating to weight, including but not limited to live and dead weights and other information necessary for component verification and coordination with other trades.
- C. Submittal Schedule Provide a detailed submittal schedule including all requirements of this Division and its subdivisions to the Architect and Engineer within thirty (30) days of contract award.

- Contractor shall submit for the Engineer's approval a Submittal Schedule for the performance of the work that is consistent with the requirements of the project schedule. The Submittal Schedule shall allow reasonable time for the Architect and other consultants review. If the time for Architects/Engineers review is not otherwise specified, the review period (from date of receipt) shall be a minimum of ten (10) business days. Once approved by the Architect/Engineer, submittal dates and time limits established by the Submittal Schedule shall not, except for reasonable cause, be changed or exceeded by the Contractor.
- 2. For each submittal required by the Contract Documents, the schedule shall include: specification section number, subsection/paragraph identification number, item description (as stated in the applicable specification section, subsection or other Contract Document) and the scheduled delivery date to the Architect/Engineer.
- 3. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project schedule resulting from any deviation to the approved Submittal Schedule, including but not limited to; payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer as may be required to perform out of sequence, stacked, critical, delayed, unscheduled or multiple reviews of required submittals necessitated by rejection of a prior submittal, (cumulatively and hereinafter, "Additional Review Costs")
- D. Catalog Cuts & Submittal Literature
  - 1. Catalog cuts, submittal literature and published material may be included to supplement scale drawings provided that the actual make and model of equipment being submitted on is identified.
  - 2. Submittal literature, drawings and diagrams shall be specifically applicable to this project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item.
- E. Shop Drawings:
  - Shop drawings shall include all significant systems, equipment and components, including but not limited to all equipment, devices, connections and elevations. Include all related specialty rooms (i.e. mechanical, electrical, data/technology). Drawings shall be at a minimum scale of ¼" per 1'-0" and shall be fully coordinated with the work of other trades and/or sections.
  - 2. Identify congested areas and clearly indicate solutions to space problems, developed in conjunction with the work of other trades and/or Sections. Identification of space problems without proposed solutions is not acceptable and is grounds for rejection. For such areas indicate, superimposed, the work of all trades and/or Sections involved and:
    - a. Clearly identify each area of congestion and deviations from the Contract Documents, and:
    - b. Proposed solution(s), clearly documented and signed-off by all other trades and/or Sections involved.

- F. Anchorage and Supports: Submit details and calculations for support and anchors that are not specifically detailed on the drawings. All calculations must meet current seismic and structural code.
  - 1. Provide details and calculations for equipment per local adopted building codes:
    - a. Having an operating weight over 400 pounds or more and mounted directly to the floor.
    - b. Having an operating weight over 20 pounds and suspended from the roof, floor, or wall or supported by vibration isolation devices.
  - 2. Where pre-approved bracing systems will be employed, submit:
    - a. System component brochure describing components used and detailed installation instructions.
    - b. Loads to be transmitted to the structure at anchor points.
  - 3. Where anchorage, support, and bracing are not detailed on the drawings, and preapproved systems are not used, submit details and calculations of proposed systems. Include:
    - a. Anchorage and Supports
      - Where equipment substitutions change the weight, size, configuration, or other aspects of systems and equipment that will affect the performance of anchorages and/or supports, submit calculations for proposed anchors and supports, and install them as shown in these calculations.
      - 2) Where substitutions will have no effect on anchors and supports detailed on Contract Documents, submit information on sizes, weights, center of gravity and other relevant information to demonstrate this fact.
- G. Shop Fabrication Drawings: Drawings are for the Contractor's use and shall be its responsibility. Do not submit shop fabrication documents unless specifically requested.
- H. Testing: Coordinate Shop Drawings to include any additional components for proper system testing.
- I. Certificates: Submit final inspection certificates signed by governing authorities.
- J. Operating and Maintenance Instructions and Manuals.
  - Three (3) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner within ninety (90) days of issuance of final occupancy permit. Each set shall be electronic or permanently bound with a hard cover. The following identification shall be inscribed on the covers, "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor, and the Contract number. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8 1/2" x 11" with large sheets of Drawings folded in.
  - 2. Instructions on major items, including but not limited to: switchgear, generators and specialty units, shall be by representative of manufacturer of respective equipment.
  - 3. Submit as identified below and as noted in other specification references.

- a. Names, addresses and phone numbers of contractors and subcontractors. List of all system components, with the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.
- b. Complete operating and maintenance instructions and parts lists of all equipment and component parts. Data sheets to show all connections, ratings, characteristics, wiring connections, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or failure, and description of operating, test, adjustment, and maintenance procedures.
  - 1) Where data sheets included in manual cover equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
- c. Operating Instructions should include, but not be limited to:
  - 1) Normal starting, operational and shutdown procedures, including emergency procedures for each type of equipment/system.
  - 2) Equipment wiring and control diagrams.
  - All other items as may be specified/required by this Section and the Contract Documents.
- d. Maintenance Instructions
  - 1) All items as may be specified/required by this Section and the Contract Documents.
- e. Manufacturers Data (each piece of equipment)
  - 1) Installation instructions
  - 2) Drawings & specifications
  - 3) Parts List, including recommended stock and long lead parts/components.
  - 4) Wiring and riser diagrams.
  - 5) Warranties and guarantees for all equipment, materials and components, including repair, replacement and labor from both Contractor and manufacturer as required by the Contract Documents.
  - 6) Certificates of Installation manufacturer's certification of supervision during equipment installation and start-up procedures.
  - All other items as may be specified/required by this Section and the Contract Documents.
- K. Record Documents.
  - Maintain one (1) complete set of prints and specifications at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions, request for information and/or approved change orders. Record locations and depths of buried and concealed system components from fixed, easily identifiable objects, such as

building walls or other fixed physical objects. Where systems are concealed in walls or other fixed physical objects, indicate distances from building corners or other building features not likely to be disturbed by fixture alterations.

- 2. Submit Record Drawings within 90 days of system acceptance by owner.
- L. Drawings, specifications (as-builts) and approved submittals.
  - 1. Where the project use a BIM model the contractor shall keep the model updated in a similar fashion, maintaining the current project record as described in (a), above and submit, an addition to all other requirements of this Section and other provisions of the Contract Documents a complete and accurate BIM model for the project.
  - 2. Prior to Substantial Completion, obtain from the Architect a complete set of printed drawings at the Contractor's cost. Record all revisions to these drawings to indicate as-built conditions. Indicate all changes, including RFI's, on this set of documents. Submit one set of blueprints of these revised drawings for review. Make necessary changes and deliver to Architect one set of electronic documents, including any BIM model, upon Final Completion and Acceptance.
  - 3. Provide a full size copy of record one-line diagrams, laminated, and hung on available wall space in the main electrical room. Obtain Record prints from Owner's Representative at Contractor's cost.
  - 4. All test reports, certifications, and inspection reports.
  - 5. AHJ/Specialty AHJ Approvals (i.e. Fire Marshal and/or Fire Department system approvals).
  - 6. Substantial and Final inspection certificate signed by governing authorities.
  - 7. All other items as may be specified/required by this Section and/or other provisions of the Contract Documents.

#### 1.9 EQUIPMENT DEVIATIONS AND SUBSTITUTIONS

- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
- B. No substitutions will be allowed and/or considered unless the description of a product includes the phrase "approved equal" and then only upon a determination as to equivalency and impact upon the project budget, schedule and the work of others, including any redesign of the project or its system components by the Architect, Engineer or other trades. The final determination as to sufficiency or acceptance of any such substitution and/or deviation properly requested and submitted by Contractor will lie solely with the Architect/Engineer. Contractor may not implement substitutions that have not been approved by Architect/Engineer.
- C. Unless specified elsewhere in the Contract Documents, a minimum of two (2) weeks shall be allowed for evaluation of any substitution. The burden of all systems re-engineering/design, testing, suitability and constructability is solely placed upon the Contractor for all deviations from the basis of design as reflected in the Contract Documents.
- D. If approved by Architect/Engineer, all such redesign, including all new drawings and detailing required, will be prepared by the Architect/Engineer and their sub-consultants for Change Order

documentation for approval by Owner and the Authority Having Jurisdiction will be paid by the Contractor as part of the Deviation Review Costs.

- E. When the Engineer approves a substitution, the approval is given with the understanding that the Contractor guarantees the article or material substituted to be equal to or better in every respect than the article or material specified. The Contractor shall also assume complete responsibility that the article or material will fit the job as far as space, access, and servicing requirements.
- F. Where several materials are specified by name for one use, select for use any of those so specified subject to compliance with specified requirements.
- G. Whenever item or class of material is specified exclusively by detail specification, trade name, manufacturer's name or by catalog reference, use only such item, unless written approval is given. Submit written requests in accordance with these and referenced specifications.
- H. Make no substitutions for materials, articles or process required under contract unless written approval is obtained.

### 1.10 COORDINATION

- A. Prior to construction, coordinate installation and location of systems, devices and equipment with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence
- B. Drawings and corresponding electronic media are diagrammatic and indicate the general arrangement of systems and work included in the Work. Consult the drawings, details and other electronic media for locations of fixtures and equipment; where same are not definitely located, obtain this information from the Architect/Engineer.
- C. Take all dimensions from Architectural and Structural Drawings, certified equipment drawings and from the actual field measurements before fabricating work. All conflicts shall immediately be reported to the Architect/Engineer. Contractor is solely responsible for conflicts known or which reasonably should have been know but not reported or resolved before commencement of the work
- D. Coordinate connection of systems with interior/exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- E. Before submitting a bid for the work the Contractor shall visit the site and become familiar with all the work on other related Drawings and Specifications, and plan the work to provide the best possible assembly of the combined work of all trades. No additional costs will be considered for work which has to be relocated due to conflicts with other trades.
- F. If, after examination of the bidding documents relating to the work, the Contractor has queries concerning the nature and scope of the work or intent of the Specifications, he/she shall

promptly request clarification from the Architect/Engineer. After contract award, claims of ignorance of the intent and scope of the contract shall not be allowed.

G. Contractor is responsible for coordinating the schedule of inspections by Engineer at appropriate stages of construction such as rough-in, pre-final, and final, and at other times required by the Specifications or by the construction. Notify Architect and Engineer seven (7) days in advance of proposed site visit. Notification constitutes certification that construction is, or will be, complete and ready for observation. In the event that construction is not ready for observation, contractor shall bear the cost of additional site visits.

### 1.11 COORDINATION DRAWINGS

- A. Detail major elements, components, systems, equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  - 1. Planned system distribution layout, including specialty device locations and access for operation
  - 2. Clearances for installing and maintaining insulation.
  - 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  - 4. Equipment and accessory service connections and support details.
  - 5. Other systems installed in same space.
  - 6. Exterior wall and foundation penetrations.
  - 7. Fire-rated wall and floor penetrations.
  - 8. Ceiling and wall-mounted access doors and panels required to provide access to operating devices or items needing access for proper maintenance
  - 9. Sizes and location of required concrete pads and bases.
  - 10. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  - 11. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

#### 1.12 SEQUENCING AND SCHEDULING

- A. Coordinate equipment installation with other building components.
- B. Arrange for space, chases, slots, and openings in building structure during progress of construction to allow for distribution system installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of all materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

- E. Some equipment may require temporary installation during one phase and require relocation to final location under another phase. Provide all associated labor and materials to accommodate this phasing.
- F. Coordinate connection of all systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors if items requiring access are concealed behind finished surfaces. Access panels and doors will be required.

### 1.13 ELECTRICAL WIRING AND COORDINATION

- A. In general, power wiring will be provided under DIVISION 26 ELECTRICAL, and control wiring will be provided under DIVISION 23 HVAC, unless otherwise specified.
- B. The following schedule summarizes the division or work and material responsibilities.

ITEM	FURNISHED UNDER	SET IN PLACE OR MOUNTED UNDER	WIRED AND CONNECTED UNDER
Equipment motors	MD 1	MD 1	ED 2
Resistance heaters	MD	MD	ED
Fire protection controls, including remote switches, flow switches	MD	MD	ED
Liquid chiller starters, where specified	MD	MD	ED
Motor controls where specified as an integral package	MD	MD	ED
Motor controllers	ED 4	ED 4	ED
Resistance type heater controllers	MD 6	ED 4	ED
Magnetic contactors and magnetic starters with overload trip assembly	ED 4	ED 4	ED
Integral control transformers	MD 6	ED 4	ED
Cover-mounted control devices	MD 6	ED 4	ED
Manual motor starters with overload trip assembly	ED 4	ED 4	ED
Motor starter switches	ED 4	ED 4	ED
Disconnect switches fused and unfused	ED 4	ED 4	ED
Thermal or thermal-magnetic circuit breakers	ED 4	ED 4	ED
Fuses	ED 4	ED 4	ED

Duct smoke detectors	ED	MD	ED 3
Smoke and fire/smoke dampers (with and without end switches)	MD	MD	ED 3
Control power source for temperature and equipment control panels	ED	ED	ED
Electric temperature control relays and miscellaneous devices	MD	MD 5	MD 5
Level and float switches	MD	MD 5	MD 5
Pipe mounted control devices such as flow switches, flow sensors, valves, and wells.	MD	MD 5	MD 5
Thermostats and space sensors.	MD	MD 5	MD 5
Duct mounted control devices such as temperature, humidity, flow and pressure sensors.	MD	MD 5	MD 5
Damper actuators.	MD	MD 5	MD 5
Control dampers.	MD	MD	
Medical Gas Alarms	MD	MD	ED
Variable frequency drives (vfd) specified to be mounted on or in the mechanical equipment.	MD	MD	ED
VFD specified to be mounted separately from the mechanical equipment	MD	ED	ED

C. Notes: (1) MD: Mechanical Divisions 21, 22, 23. (2) ED: Electrical Division 26. (3) Fire Alarm related and power wiring provided under Division 26; Control-related wiring and relays provided under Division 21, 22, 23. (4) If furnished as part of factory equipment under Division 21, 22, 23, wiring and connections only by Electrical Division 26. (5) If any control devices carry the Full Load Current to any motor, they shall be furnished under Division 21, 22, 23, but shall be set in place and connected under Division 26. (6) Except where indicated as part of a motor control center on the Electrical Drawings. (7) Division 26 shall provide the logic contact closure and the wiring to the local DDC temperature control panel. Division 26 shall also provide interface with the fire alarm system, proof of flow devices (duct/fan air flow switches), connecting wiring, smoke control logic, panel, relays, damper monitoring, and associated devices for a complete smoke control system.

### 1.14 ACCESSIBILITY

A. Contractor is responsible for verifying that equipment and devices will fit within the space shown on the drawings. Contractor shall locate all equipment which must be serviced, operated or maintained, in fully accessible locations.

B. Minor deviations from the drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without approval from the Architect/Engineer.

### 1.15 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed shall conform with all local, State, Federal and other applicable laws and regulations.
- B. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- C. Installer Qualifications: Company specializing in performing the work of this section. Company personnel shall be approved by manufacturer for all product installations and required training.
- D. Conform to all applicable standards, codes and regulation and industry best practice requirements.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. All materials and equipment shall be new, shall bear manufacturer's name, and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended. All equipment and components shall include UL label and/or marking on equipment body/device including manufacturer's name, pressure rating(s), electrical classification(s), limits and ratings as applicable to individual components for the purpose specified and intended.
- G. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the Drawings may be furnished, provided such proposed equipment is approved in writing and connecting electrical services, such as circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.
- H. Listing and labeling: Provide motors that are listed and labeled. Terms "listed and labeled": as defined by UL, NEC, Article 100 or other applicable recognized agency as specified in the Contract Documents.
- I. Cutting & Patching: Unless otherwise required by the Contract Documents, Contractor shall be responsible for all cutting, fitting and patching required to complete the Work, or to make portions of the Work and existing conditions fit together properly, and all such areas shall be restored to the conditions existing prior to the cutting, fitting and patching unless otherwise provided in the Contract Documents
- J. Lead Free Requirements: Contractor shall endeavor to use lead free products and where required by law, ordinance, regulation or standard all materials products and practices shall comply with limitations and requirements as to the allowable limits and/or percentages of lead. Lead free products must be certified by and independent 3rd party.
1. This provision shall apply to any and all similarly regulated materials, products and practices that may be considered hazardous or are otherwise regulated by applicable law, ordinance regulation or standard in the project local.

# 1.16 DELIVERY, STORAGE, AND HANDLING

- A. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage, and theft. At completion, all work, equipment and materials shall be cleaned, and damage repaired by Contractor. Damaged equipment will be replaced by the contractor if Owner does not accept repairs done to the equipment. Such replacement shall be scheduled to minimize building system interruption of occupied or scheduled for occupancy.
- B. Material delivered at the site shall not be left exposed to the weather or left unattended. Deliver pipes, tubes and conduit with factory-applied end-caps. Contractor shall be responsible to maintain end-caps or provide temporary end caps on all open-ended piping, tubes and conduit through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- C. Protect bright finished shafts, bearing housings and similar items until in service.
- D. Protect plastic pipes and materials from sunlight and support to prevent sagging and bending.
- E. Elevate stored materials above grade. When stored inside, do not exceed structural capacity of the floor.
- F. Provide protective coatings to materials to prevent damage and/or infiltration of moisture and dirt on all materials and equipment including but not limited to cast iron and steel valves.
- G. Contractor shall check the openings in the building and the size of the doors, passages, and openings through which equipment is to be admitted. Wherever necessary, he shall provide the equipment in sections or knocked down in order to admit the equipment through these openings.
- H. Contractor shall provide all rigging, erection and hoisting equipment as required to handle or place equipment, conduit, cable tray and conductors in position. This rigging and hoisting equipment shall only be attached and placed on the structure in locations as approved by Architect/Engineer at the site.

# 1.17 PERMITS, FEES & UTILITIES

- A. Contractor shall arrange and pay for all permits, fees, and inspections required to perform the Work. The Contractor shall present the Owner with properly signed certificates of final inspection before the Work will be accepted.
- B. Contractor shall call for all inspections by local building official(s) when they become due, and shall not cover any work until approved by these governing authorities.
- C. Contractor shall make all arrangements with power utility company associated with the work and include required payments for meters, services and connection charges and materials

furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

## 1.18 DOCUMENT OWNERSHIP

A. The Drawings and Specifications, combined with the calculations, field data, notes, and reports, are the intellectual and real property of the Architect and/or Engineer. This covers all forms of written and recorded or electronic media. The reuse of these documents without specific permission of the Architect and Engineer is prohibited. The Drawings may be employed by the Owner and Contractor for the express use of constructing, commissioning and operating the facility only upon proper execution of an Agreement for Use of Electronic Files & Data.

# 1.19 GUARANTEE AND WARRANTY

- A. Contractor warrants to Owner that the materials and equipment provided under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials and equipment not conforming to these requirements, including substitutions not properly approved by Change Order, shall be considered defective. This warranty excludes remedy for damage caused by improper or insufficient maintenance, improper operation or normal wear, tear and usage. Contractor shall assign to Owner, or otherwise assure the Owner has the full benefit of, all warranties and guarantees of manufacturer, subcontractors, sub-subcontractors and suppliers, and Contractor shall perform the Work in a manner that does not adversely affect or invalidate any available warranties or guarantees.
- B. Contractor shall warrant and guarantee all work against faulty material or workmanship for a period of one (1) year from the date of final completion and written acceptance by the Owner, unless specified more stringently elsewhere in the Contract Documents.
- C. If the project is occupied or the systems placed in operation in several phases at the request of the Owner, the guarantee of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation, tested, commissioned and accepted, in writing, by the Owner. The use of building equipment for temporary service and testing or phases of work completed prior to the projects final completion and acceptance by the Owner does not constitute the commencement of the warranty period.
- D. If a defect or deficiency in the Work is discovered within the one (1) year Warranty & Guarantee period or within such longer period as may be prescribed by the Laws or by any specific guarantee, and Owner elects to have Contractor correct such defect or deficiency, Owner shall notify Contractor of such defect or deficiency in writing. This period of correction relates only to the specific obligation to correct defects and deficiencies and in no way otherwise limits the Contractor's responsibility for Work that is not in accordance with the Contract Documents, If Contractor fails to timely correct defects or deficiencies in the Work, Owner may, at its sole option, correct them and charge contractor for all cost therefore.
- E. Specific exclusions, if any, from this one (1) year warranty and guarantee period are listed in the individual specification sections.

## **1.20 LIMITATIONS OF LIABILITY**

- A. To the extent any of the following provisions are not more stringently included in the Contract Document the following Limitations of Liability shall apply:
- B. Architect/Engineer is not responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and is not responsible for Contractor's failure to perform or furnish the work in accordance with the Contract Documents.
- C. In the event that Architect/Engineer's employees or sub-consultants make comments or issue warnings about safety issues, such comments and warnings shall be considered to have been offered by a Good Samaritan and shall not impose any obligation or responsibility.
- D. Engineer will not be responsible for the acts or omissions of Owner, Contractor, any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the portions of the work
- E. Contractor understands and acknowledges that Engineer is not authorized to order extra work or issue Change Orders to the work, however in the event and to the degree that Engineer may offer advice, suggestions, and opinions Contractor shall not rely on such advice, suggestions, and opinions unless directed in writing by Owner or its designated representative, and shall, in no event, make any claim against the Engineer for any such advice, suggestions, and opinions.
- F. To the fullest extent permitted by law, Contractor shall indemnify and hold harmless Architect, Engineer, and their joint ventures, officers, directors, partners, employees and agents from and against any and all claims, costs, loses and damages (including but not limited to all fees and charge of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused in whole or in part by the negligent acts or omissions of Contractor, Contractor's officers, directors, partners, employees, agents; or contractor's subcontractors or material men in the performance of Work. Contractor shall direct its insurer to list Architect, Engineer, and their joint ventures, as Additional Insureds on general liability insurance policies covering this project. Prior to commencing work, Contractor shall submit copies of its certificate of insurance to both Architect and Engineer.

# 1.21 SAFETY

A. Contractors must conduct a weekly safety meeting with their employees and provide documentation as to attendance and topics of discussion. Engineer's construction support services do not constitute review or approval of Contractor's safety procedures. Contractor shall comply with all OSHA regulations. Contractor is required to obtain and pay for insurance required to cover all activities within Contractor's Scope of Work.

## PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
  - 2. Manufacturer: Unless otherwise specified, company specializing in manufacturing specified products for at least 3 years.

# 2.2 MATERIALS AND EQUIPMENT

- A. The device numbers noted in this specification are generally those of a specific manufacturer and represent the minimum quality required as the basis of design for this project. Subject to the Substitutions and other provisions of the Contract Documents, Contractor may submit equivalent devices from the other manufacturers listed in the section.
- B. Materials and equipment used in carrying out these specifications shall be new and have UL listing, or listing by other recognized testing laboratory when such listings are available.
- C. All material shall bear manufacturer's name, model number, electrical characteristics and other identification and shall be the standard product of manufacturer regularly engaged in production of similar material.
- D. Construction of equipment shall be as follows:
  - 1. All prefabricated equipment shall be designed and constructed in such a manner that all parts of said equipment and the equipment as a whole, including attachments, will resist the forces (including seismic where applicable) to which they may be subjected.
  - 2. Unless otherwise specified or required, design criteria shall be no less than 1.5g for lateral forces and 0.6g for vertical forces.
  - 3. Provisions for support and anchorage of equipment shall be an integral part of each item and shall include the fastening means and all necessary internal and external bracing, brackets and connections.
- E. Specifications for many items are or may be described on the drawings, including but not limited to wiring devices, lighting fixtures, control devices, etc. are or may be described on the drawings. Contractor shall promptly advise Architect of any conflicts or discrepancies.
- F. Except for conduit, conduit fittings, outlet boxes, wire and cable (600V and below only), all items of equipment or material shall be the product of one manufacturer throughout.
- G. The documents contain specifications regarding equipment design, including BIL levels, AIC ratings, and series ratings. In all cases provide equipment sufficient for the use intended. Do not provide materials whose ratings fall below those included in the Documents.

# PART 3 - EXECUTION

# 3.1 UTILITY SERVICE(S)

- A. Contractor shall be responsible for verifying and coordinating the work with local utility companies providing service to the facility and/or site and coordination with the work of others. This shall include, but not be limited to:
  - 1. Confirmation of schedule and service routing and sequence of the work to be performed by each utility, contractor, subcontractor or others to ensure that the work can be performed without impact to the project schedule and with minimum interruption to services.
  - 2. Verification of utility services point of entry to the facility, including applicable invert elevations, proper placement of sleeves and/or penetrations and sealant thereof.
  - 3. Establishing utility point of contact, documenting the local utility company representatives:
    - a. Company:
    - b. Contact Person:
    - c. Contact Telephone Number:
    - d. Provide required connections for each incoming utility service.

# 3.2 ELECTRICAL SYSTEMS

- A. Visit site and observe conditions under which work must be performed.
- B. Before starting work, carefully examine Architectural, Civil, Landscape, Structural, Plumbing, Heating, Ventilating and Air Conditioning drawings to become thoroughly familiar with conditions governing work on this project. Verify elevations, measurements, rough-in requirements of equipment and its installation location before proceeding with the work. Install equipment with access as required by the NEC.
- C. Circuit "tags" on the Electrical Drawings show the circuits in each home run and the panel designation. Show the actual circuit numbers on the finished record drawing, and on the panel directory card. Provide an insulated grounding conductor sized in accordance with NEC in every power circuit.
- D. The general directions and location of homeruns are indicated on Drawings and are to be extended to panels as though routes were completely shown. Items which are installed other than as shown on Drawings and without receiving prior written approval will be ordered removed and installed as shown without additional cost to Owner.
- E. The Drawings do not indicate the exact number of wires in each conduit for the branch circuit wiring. Provide the correct quantity of wires as indicated by: the circuit numbers indicated, wiring diagrams, and by applicable requirements of the NEC.
- F. Electrical Drawings are diagrammatic and shall not be scaled for exact sizes. Adjust location of conduits, panels, equipment, pull boxes and fixtures to accommodate the work and to prevent interferences.
  - 1. Lines which pitch have right-of-way over those that do not. Lines whose elevation cannot be changed have right-of-way over lines whose elevations can.
  - 2. Make offsets, transitions, and changes in direction in raceways as required to maintain proper headroom pitch of sloping lines.
- G. Wire and cable routing shown on the Drawings is approximate. Route wire and cable as required to meet Project Conditions.

- H. When wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.
- I. The Drawings are diagrammatic. They do not show every offset, bend, conduit body, elbow or junction box that may be required to install work in the space provided and avoid conflicts. Follow the Drawings as closely as is practical and install additional bends, offsets and elbows where needed by local job site conditions. Provide necessary junction boxes to meet code regulations for the allowed number of conduit bends.
- J. Establish sizes and locations of the various concrete bases required. Coordinate and provide all necessary anchor bolts together with templates for holding these bolts in position.
- K. Provide supports, blocking, hangers, and auxiliary structural members required for support of work.
- L. Furnish and set all sleeves for passage of raceways through structural, masonry, and concrete walls, floors, and elsewhere for proper protection of the raceways.
- M. Establish size, location, and count of cast-in conduits or conduits to be concealed underneath the foundations. Coordinate with steel reinforcing.
- N. The architectural drawings govern the locations and elevations of all electrical equipment, devices and fixtures. Resolve conflicts with the Architect prior to rough-in.
- O. Verify that the physical dimension of each item of electrical equipment will fit the available space. Coordinate electrical equipment space requirements with the allotted space provisions, and access routes through the construction area.
- P. Coordinate rough-in and wiring requirements for all mechanical, kitchen and other equipment with equipment supplier and installer. Make installation in accordance with rough-in and wiring diagrams provided by equipment supplier and installer.
- Q. Coordinate all aspects of the electrical, telephone and other utility services with the appropriate serving utility company.
- R. Coordinate underground work with other contractors working on the site. Common trenches may be used with other trades. In such areas, maintain clearances as required by codes and ordinances.
- S. Coordinate underground work with foundation plans and work.
- T. Existing wires, conduits, pipes, ducts or other service facilities are shown in a general way only. The Contractor shall visit the site and make exact determination of the existence of any such facilities prior to submission of his bid. It is understood that he will be responsible for making the exact determination of the location and condition of these facilities.
- U. The location of utilities indicated on the plans is taken from existing public records. The exact location and elevation of public utilities must be determined by the Contractor. The Contractor shall ascertain whether any additional facilities other than those shown on the Drawings may be present.

- V. Call to the attention of the Architect any error, conflict or discrepancy in Plans and/or Specifications. Do not proceed with any questionable items of work until clarification of same has been made. Supplementary Details and Plans may be supplied as required and they will become a part of the Contract Documents.
- W. Arrange work to reduce interruption of any existing service to minimum. When interruptions are unavoidable, consult Owner or Utility involved and agree in writing, with copy to the Architect, upon a mutually satisfactory time and duration.
- X. No circuits shall be turned off without prior approval from Owner. Coordinate with the operations, normal activities, building access, etc. Coordinate work with other crafts for proper scheduling.

# 3.3 EQUIPMENT INSTALLATION

- A. Follow manufacturer's instructions.
- B. Where the product has no manufacturer's instructions, follow these specifications. Where neither the manufacturer nor these specifications contain such instructions, install in accordance with the standards listed above. No allowance of any kind will be made for negligence on part of Contractor to foresee means of bringing in or installing equipment into position.
  - 1. Verify all dimensions by field measurements.
  - 2. Install systems, materials, and equipment to provide the maximum headroom possible.
  - 3. Install systems, materials, and equipment to comply with approved submittal data, including coordination drawings
  - 4. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
  - 5. Fit surface panels, devices and outlets with neat, appropriate trims, plates or covers, without over-hanging edges, protruding corners or raw edges, to leave a finished appearance.
  - 6. Extend maintenance and access components (i.e., grease fittings, service panels, and similar items) to accessible locations.
  - 7. Install equipment to allow right of way for piping installed at required slope.
- C. Locations:
  - 1. Verify all locations with actual field conditions, architectural, structural, electrical, plumbing, heating and ventilating plans to avert possible installation conflicts.
  - 2. Architect reserves the right to make minor changes prior to installation without cost to Owner.
  - Coordinate work with that of other trades to assure symmetrical placing of fixtures, sprinkler heads and other exposed components with respect to ceiling tile, grilles, etc. See Architectural reflected ceiling plan for exact location of light fixtures and other equipment.
  - 4. Any work which is incorrectly installed without prior verification without required coordination will be ordered removed and relocated and any changes or damage resulting to other work shall be repaired and/or replaced at no cost to the Owner.
  - 5. In general, locate all finished devices or other exposed finished devices as indicated on or by symbols on drawings. Where devices or other exposed finished components occur in face, decks or base millwork, walls, ceilings or other finished surfaces carefully coordinate with details and arrangements of same.
  - 6. All mounting heights shown on drawings are from finish floor to centerline unless otherwise indicated or required by code. Mounting heights at non-typical locations shown

with (+) sign and height required noted adjacent to such device. Devices located in concrete block, brick or tile walls are to be adjusted in height to coordinate with modular joints of the materials. Verify requirements with Architect prior to installation.

- 7. Wiring Requirements: Install wiring complete to every outlet with all devices shown and/or required. All wiring to be in raceways and concealed throughout finished areas unless specifically noted otherwise. For the purpose of electrical specifications, all areas, with the exception of boiler rooms, mechanical rooms and mechanical spaces, are to be considered as finished areas.
- D. Equipment Connections
  - 1. Coordinate the work with that of other trades to ensure all required connections are provided to ensure proper installation and operation.
  - 2. Provide complete electrical connections for all items of equipment requiring such connections, including incidental wiring, materials, devices and labor necessary for a finished working installation.
  - 3. Verify the location and method for connecting to each item of equipment prior to roughing-in. Check voltage and phase of each item of equipment before connection.
  - 4. Make motor connections for the proper direction of rotation.

# 3.4 NOISE CONTROL

- A. Provide insulation, isolators and other sound attenuation requirements as specified by Contract Documents.
- B. Back to back or straight through boxes are not permitted unless specifically noted on the drawings.
- C. Contactors, transformers, starters and similar noise producing devices shall not be placed on walls which are common to occupied spaces unless specifically called for on the drawings. Where equipment is mounted on wall common to occupied spaces, provide shock mounting or noise isolators to effectively prevent transmission to occupied spaces.
- D. New contactors, starters, transformers and like equipment found noticeably noisier than similar equipment of same type are to be removed and replaced as directed by Architect at no cost to owner.
- E. Route raceways along corridors or other noncritical noise space to minimize penetrations through sound rated walls. Seal raceway penetrations through sound rated walls.

# 3.5 FIRE WALL PENETRATIONS

- A. Perform necessary fire rated wall sealing for the work in accordance with Division 7 Fire and Smoke Protection, if available; otherwise refer to code.
- B. Provide necessary wall material to maintain fire wall rating where flush mounted equipment or components installed.
- C. Where systems or components penetrate floors, ceilings, ducts, chases and fire walls, provide fire stopping to maintain integrity of the fire assembly. Fire stopping method shall be approved by the authority having jurisdiction.

- D. Where electrical boxes with total area exceeding 16 square inches are located in fire resistive walls, fire stopping shall be provided to maintain integrity of the fire assembly.
- E. Where electrical boxes are installed on opposite sides of a rated wall, horizontal separation between the boxes shall be a minimum of 24-inches. Horizontal separation of these boxes may be less than 24-inches if a UL approved protective material is utilized.
  - 4. Electrical boxes shall not be installed back to back in rated walls.
    - a. The aggregate surface area of the boxes shall not exceed 100 sq in per 100 sq ft of wall surface.

# 3.6 EQUIPMENT SUPPORT

- A. General
  - 1. Provide a system of supporting devices and hangers for support and bracing of piping, conduit and equipment as required by code or as provided under this Division as indicated on plans and as described herein.
  - 2. Do not install supporting devices so as to obstruct access to equipment.
  - 3. Floor-mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastening in all cases.
  - 4. Do not support conduits, conductors, or equipment from other piping, conduits, ceiling grids, equipment, ductwork, or ceiling supports. In all cases, provide independent supports for such components and equipment.
- B. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to code (including seismic codes where applicable).
  - 1. Construct concrete bases and form equipment anchorages as detailed in the structural drawings.
  - 2. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use concrete and reinforcement as specified in Division 3 Sections and the Structural Drawings.
- C. Metal Supports & Anchorages
  - 1. Refer to local codes, practices and standards for installation and material requirements and limitations relating to the use of metal supports and anchorages (including applicable seismic requirements).
  - 2. Refer to Division 5 Section "Metal Fabrications" for structural steel if available
  - 3. Field Welding: Comply with AWS D1.1.
- D. Wood Supports & Anchorages
  - 1. Refer to local codes, practices and standards for installation and material requirements and limitations relating to the use of wood supports and anchorages (i.e. fire retardant materials).

- 2. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor materials and equipment.
- 3. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- 4. Attach to substrates as required to support applied loads.
- E. Grouting
  - 1. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
  - 2. Clean surfaces that will come into contact with grout.
  - 3. Provide forms as required for placement of grout.
  - 4. Avoid air entrapment during placement of grout.
  - 5. Place grout, completely filling equipment bases.
  - 6. Place grout on concrete bases and provide smooth bearing surface for equipment.
  - 7. Place grout around anchors.
  - 8. Cure placed grout.

## 3.7 PAINTING

- A. Painting of systems, equipment, and components is specified in Division 9. Unless and to the extent that painting is not specified elsewhere in the Contract Documents, all exposed materials in finished areas and on exterior walls shall be painted to match surrounding surfaces.
- B. Contractor shall be responsible for and shall coordinate the timing of painting with the work of other trades and to minimize the requirements for damage and touchup to the work.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

# 3.8 CUTTING, PATCHING AND CORE DRILLING

- A. General
  - 1. Refer to Divisions 1, 3 and other related provision of the Contract Documents, including Structural Drawings and Specifications for requirements relating to cutting, patching and core drilling of walls, floors and other surfaces.
  - 2. Do not cut or break any steel or wood framing, concrete, masonry, or partitions, etc., without permission from the Architect or as shown on the Drawings.
  - 3. Subject to the provisions of this Section and other portions of the Contract Documents cut, channel, chase and drill floors, walls, partitions and ceilings as necessary for the proper installation, support and anchorage of piping, ductwork, raceway, boxes, and other equipment.
  - 4. Repair any damage to the building, building systems, equipment, or finish.
  - 5. Perform repairs with materials matching the original, and install in accordance with appropriate sections of the Contract Documents.
  - 6. Where trenching is done through existing paving, walks, curbs, etc. Contractor is responsible for patching and repairs to original condition.
  - 7. In new work, patch and refinish all finished surfaces damaged by this contractor to match adjacent surface.

- 8. Where new work is installed in the existing building, patch and refinish surfaces damaged to match existing. Refinishing to be as directed by the Architect.
- 9. All related refinishing to be as directed by the Architect.
- B. All cutting, patching and/or core drilling of structural systems that are do not appear on or that deviate in any way from the Structural Drawings must be preapproved by the Structural Engineer and Contractor shall provide all data, calculations and/or other requirements as maybe required by the Structural Engineer, prior to commencement of the work, including but not limited to:
  - 1. X-Ray of structural systems to show the actual location of reinforcement.
  - 2. Size and dimensions of penetrating ductwork, piping or conduit including placement within desired opening and required clearances, means of fastening and/or support including all anchoring systems and fasteners.
  - 3. As a general rule, subject to adjustment by Structural Engineer, penetrating ductwork, piping or conduit shall pass through the center of all structural openings, avoiding structural members by minimums specified on the Structural Drawings.
- C. Core Drilling Layouts
  - Unless otherwise specified in the Contract Documents Contractor shall provide to the Structural Engineer a complete floor by floor core drilling layout for all required floor core penetrations in advance of the work for Structural Engineer's review and approval. Core drilling layouts shall include size, dimension and specific locations of core drilling for all trades. Contractor shall not be permitted to conduct independent coring without providing such layout to Structural Engineer.

# 3.9 EXCAVATION, BACKFILL & WATERPROOFING

- A. Refer to Divisions 1, 2, and other related provisions of the Contract Documents, including but not limited to Sitework and Structural Drawings and related specifications for requirements relating to excavation, backfill and waterproofing for each trade.
- B. Do necessary trenching and excavating for installation of underground piping, conduit, raceways and equipment. Use necessary precautions not to affect the bearing value of soil under and near footings. Excavate trenches with proper pitch six inches deeper than required by line grade and prefill to line grade with pea gravel. Where trenching occurs through existing paving, walks, curbs, etc., patch and repair to original conditions. Compact backfill with vibratory or roller compaction equipment in nine inch layers to 90 percent density. Dispose of excess excavated material as directed. Backfill under floor slabs and under hard surfaced yard areas (i.e. walks, drives, parking areas) to be crushed rock unless otherwise indicated, compacted in nine inch layers. Backfill material and compaction to comply with Site Work Section of these Specifications.
- C. Provide and maintain ample means and devices with which to promptly remove and dispose of water entering the excavation during the time it is being prepared for the piping, raceways or equipment laying, during the laying of materials or equipment and until the backfill has been completed.
- D. Avoid, if possible, penetrations of waterproof membranes. Where such penetration is required, perform it prior to waterproofing and in accordance with Architectural details. Where penetrations are not detailed or must be conducted through waterproof membranes, provide a detail of the penetrations for approval of the Architect.

# 3.10 SAFETY & PROTECTION

- A. The Contract Documents do not include, or is Architect/Engineer responsible for the design of construction details or instructions relating to Contractor' safety or protective measures or precautions or as it pertains to its means, methods, techniques, sequences or procedures required for to perform the work.
- B. Provide necessary shoring, railing, barricades, protective devices, temporary systems/supports, safety instructions and procedures to perform the work safely and to comply with the Safety Requirements of the governing authorities.
- C. Unless otherwise specifically detailed and included, the Contract Documents represent the finished state of all systems and components related to the work and it is Contractor's sole responsibility to provide the necessary means, methods, equipment and protection of the work and those performing the work during construction. Neither Architect/Engineer nor any of their respective subconsultants shall be responsible or liable for Contractors failure to adequately protect the work or those performing the work during construction.

## 3.11 FUTURE PROVISIONS TO BE INCLUDED IN THE WORK

- A. The following provisions shall be provided for and included in the work:
  - 1. Provide pull line in each empty conduit provided for future installation of wiring.
  - 2. At all systems such as fire alarm, clock and program, intercom, etc., where future stations are to be fed from adjacent outlets or terminal cabinets, all conductors required for complete installation of additional units are to be provided to nearest outlet or terminal cabinet as required. In general, all wiring installed so it will not be necessary to remove existing conductors and re-pull additional wiring to install additional units. All spare conductors properly labeled and terminated in outlet boxes or at terminals in terminal cabinets.

#### 3.12 CLEANING

- A. General
  - 1. At all times keep the premises free from accumulation of waste materials or rubbish caused by the employees or the work. At the completion of the work, remove all superfluous materials, equipment and debris related to or resulting from the work.
  - 2. All systems, equipment and component including but not limited to all panels, compartments, points of access, surface areas, panels, whether concealed or not shall be free from debris, filings, clippings, dirt, dust and debris and in a new condition. Touch up paint where necessary.
  - 3. Where existing systems are expanded and/or remodeled, clean the new installation prior to making final connection to the existing systems.

# 3.13 ASBESTOS OR OTHER HAZARDOUS BEARING MATERIAL

A. If during the course of work, the contractor observes the existence of asbestos, asbestos bearing material or other hazardous material, the contractor shall immediately terminate further work and notify the Owner of the condition. The Owner will, after consolation with the Architect, determine a further course of action.

# 3.14 COOPERATION WITH OTHER TRADES

A. Contractor shall cooperate with and coordinate the work with that of all other trades in the performance of the work, including but not limited to; delivery of equipment and materials, furnishing material and location requirements of sleeves, bucks, chases, supports, mountings, backings, inserts, anchor bolts, cast-in-place box-out or steel embeds, routings, sequencing, locations, finished devices, etc., for proper installation of its work. Contractor shall be responsible for any and all removal, replacement or repairs to its work or the work of others for its failure to fully comply with this provision.

## 3.15 OPERATION AND INSTRUCTION

- A. Upon completion of the work and prior to final acceptance, Contractor shall operate the equipment for a period as required to fully instruct the Owner and its authorized representatives in all details of operation, adjustment and maintenance. Absent more stringent requirements found elsewhere in the Contract Documents, Contractor shall, at a minimum:
  - 1. Thoroughly review and instruct Owner and its designated representatives on all aspects of systems and facilities operations and maintenance utilizing the Instructions and Manuals submitted under the provisions of this Section. Any required instructions from manufacturer's representatives shall be given during this period.
  - 2. This requirement is in addition to any "Operation Test" specified in the Contract Documents.

## 3.16 FINAL INSPECTION

A. The Contractor shall furnish the certificates of final inspection and approval from the inspection authorities having jurisdiction.

#### 3.17 SITE VISITS BY ENGINEER

A. Engineer's responsibility is limited to normal construction support services only, consisting of office consultation, site visits, and reports to the at appropriate stages of construction such as rough-in, pre-final, and final. All costs incurred by the Engineer for additional site visits or office work required to complete the project as the result of incomplete coordination or supervision by the Contractor or the Mechanical Sub-Contractor shall be paid for by the Contractor.

END OF SECTION 26 00 00

## SECTION 26 05 09 – EQUIPMENT WIRING

## PART 1 – GENERAL

## 1.1 SUMMARY

- A. Work Included:
  - 1. Equipment connections, whether furnished by Owner or other Divisions of the Contract.
  - 2. Equipment grounding.

## 1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements (if available) apply to this Section.

## **1.3 REFERENCES AND STANDARDS**

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

## 1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

## B. In addition:

1. Verify mechanical and utilization equipment electrical characteristics with Drawings and equipment submittals prior to ordering equipment. Submit confirmation of this verification as a part of, or addendum to, the electrical product submittals.

# 1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available) apply to this Section.

# 1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

## PART 2 – PRODUCTS

#### 2.1 MATERIALS

A. Materials and Equipment for Equipment Wiring: As specified in individual Sections.

# 2.2 GENERAL

A. Unless otherwise noted, the following voltage and phase characteristics apply to motors:

- 1. 3/4 HP and Under: 120 volt, 1 phase.
- 2. 1 HP and Over: 208 volt, 3 phase.
- 3. 1 HP and Over: 480 volt, 3 phase.
- B. Safety Switches: Provide as required by NEC and as specified in Section 26 28 16, Enclosed Switches and Circuit Breakers.

# **PART 3 – EXECUTION**

## 3.1 EXAMINATION

- A. Prior to submittal of product data for electrical distribution equipment, obtain and examine product data and shop drawings for equipment furnished by the Owner and by other trades on the project. Update the schedule of equipment electrical connections accordingly, noting proper ratings for overcurrent devices, fuses, safety disconnect switches, conduit and wiring, and the like. As a minimum, this requirement applies to equipment furnished by Owner and equipment furnished under the following divisions of work under this contract:
  - 1. Division 10, Specialties
  - 2. Division 11, Equipment
  - 3. Division 21, Fire Suppression
  - 4. Division 22, Plumbing
  - 5. Division 23, HVAC, Heating, Ventilating and Air Conditioning
  - 6. Division 27, Communications
  - 7. Division 28, Electronic Safety and Security

# 3.2 INSTALLATION

- A. Do not install unrelated electrical equipment or wiring on mechanical equipment without prior approval of Engineer.
- B. Provide moisture tight equipment wiring and switches in ducts or plenums used for environmental air.
- C. Connect motor and appliance/utilization equipment complete from panel to motor/equipment as required by code.
- D. Install motor starters and controllers for equipment furnished by others.
- E. Appliance/Utilization Equipment:
  - 1. Provide appropriate cable and cord cap for final connection unless equipment is provided with same. Provide receptacle configured to receive cord cap.
  - 2. Verify special purpose outlet NEMA configuration and ampere rating with equipment supplier prior to ordering wiring devices and coverplates.
- F. Door Hardware:
  - 1. Provide dedicated circuit from nearest 208/120V emergency panelboard for door hardware power supplies. Provide complete control connections for door hardware locking mechanisms to building security system.
  - 2. Coordinate with Division 08, Openings and Drawing requirements.

# 3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Division 01, General Requirements.

# 3.4 SYSTEMS STARTUP

- A. Provide field representative to prepare and start equipment.
  - 1. Test and correct for proper rotation of polyphase motors.
- B. Adjust for proper operation within manufacturer's published tolerances.
- C. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION 26 05 09

# SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Copper building wire rated 600 V or less.
  - 2. Metal-clad cable, Type MC, rated 600 V or less.
  - 3. Armored cable, Type AC, rated 600 V or less.
  - 4. Connectors, splices, and terminations rated 600 V and less.

#### 1.3 **DEFINITIONS**

- A. RoHS: Restriction of Hazardous Substances.
- B. VFC: Variable-frequency controller.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: Indicate type, use, location, and termination locations.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Retain "Field quality-control reports" Paragraph below if Contractor is responsible for field quality-control testing and inspecting.
- C. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

# PART 2 - PRODUCTS

## 2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers:
  - 1. Belden Wire LLC
  - 2. Okonite Company
  - 3. Southwire Company
  - 4. Or Approved Equal
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Conductor Insulation:
  - 1. Type THHN and Type THWN-2: Comply with UL 83.
  - 2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
  - 3. Type XHHW-2: Comply with UL 44.

# 2.2 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Manufacturers:
  - 1. Belden Wire LLC
  - 2. Okonite Company
  - 3. Southwire Company
  - 4. Or Approved Equal
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. Comply with UL 1569.
  - 3. RoHS compliant.
  - 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:

- 1. Single circuit and multicircuit with color-coded conductors.
- 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors & Aluminum, complying with ASTM B 800 and ASTM B 801.
- F. Ground Conductor: Bare.
- G. Conductor Insulation:
  - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
  - 2. Type XHHW-2: Comply with UL 44.
- H. Armor: Steel, interlocked.
- I. Jacket: PVC applied over armor.

## 2.3 ARMORED CABLE, TYPE AC

- A. Description: A factory assembly of insulated current-carrying conductors with or without an equipment grounding conductor in an overall metallic sheath.
- B. Manufacturers:
  - 1. Belden Wire LLC
  - 2. Okonite Company
  - 3. Southwire Company
  - 4. Or Approved Equal
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Comply with UL 4.
  - 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
  - 1. Single circuit and multicircuit with color-coded conductors.
  - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors & Aluminum, complying with ASTM B 800 and ASTM B 801.
- F. Ground Conductor: Bare.
- G. Conductor Insulation:
  - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
  - 2. Type XHHW-2: Comply with UL 44.

- H. Armor: Steel, interlocked.
- I. Jacket: PVC applied over armor.

# 2.4 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers:
  - 1. Hubbell Power Systems
  - 2. Ideal Industries, Inc.
  - 3. O-Z/Gedney
  - 4. Or Approved Equal
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
  - 1. Material: Copper.
  - 2. Type: One hole with standard barrels.
  - 3. Termination: Compression.

#### **PART 3 - EXECUTION**

#### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- C. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.
- D. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

# 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Branch Circuits Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway, Armored cable, Type AC, Metal-clad cable, Type MC.

- D. Feeders & Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainlesssteel, wire-mesh, strain relief device at terminations to suit application.
- F. VFC Output Circuits: Type XHHW-2 in metal conduit.

## 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

#### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material.
  - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

#### 3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

## 3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

#### 3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

#### 3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
  - 2. Perform each of the following visual and electrical tests:
    - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    - b. Test bolted connections for high resistance using one of the following:
      - 1) A low-resistance ohmmeter.
      - 2) Calibrated torque wrench.
    - c. Inspect compression-applied connectors for correct cable match and indentation.
    - d. Inspect for correct identification.
    - e. Inspect cable jacket and condition.
    - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
    - g. Continuity test on each conductor and cable.
    - h. Uniform resistance of parallel conductors.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
  - 1. Procedures used.
  - 2. Results that comply with requirements.
  - 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

# SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Work Included:
  - 1. Grounding Electrodes
  - 2. Connectors and Accessories
  - 3. Grounding Busbar
  - 4. Grounding Conductor

#### 1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements (if available) apply to this Section.

## **1.3 REFERENCES AND STANDARDS**

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

## 1.4 SUBMITTALS

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
  - 1. Test reports of ground resistance for service and separately derived system grounds.

# 1.5 QUALITY ASSURANCE

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
- B. In addition, meet the following:
  - 1. Comply with the requirements of ANSI/NFPA 70.

#### 1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

#### PART 2 – PRODUCTS

## 2.1 MANUFACTURERS

A. Grounding Electrodes:

- 1. Erico
- 2. Thomas & Betts
- 3. Talley
- 4. Or approved equivalent.
- B. Grounding Connectors:
  - 1. Burndy Hyground Compression System
  - 2. Erico/Cadweld
  - 3. Amp Ampact Grounding System
  - 4. Or approved equivalent.
- C. Pipe Grounding Clamp:
  - 1. Burndy GAR Series
  - 2. O Z Gedney
  - 3. Thomas & Betts
  - 4. Or approved equivalent.
- D. Grounding Busbar:
  - 1. Chatsworth
  - 2. Erico
  - 3. Square D
  - 4. Panduit
  - 5. Or approved equivalent.

#### 2.2 **GROUNDING ELECTRODES**

A. Ground Rods: Copper-clad steel, minimum 3/4-inch diameter, 10-feet long, tapered point, chamfered top.

#### 2.3 CONNECTORS AND ACCESSORIES

- A. Grounding Connectors: Hydraulic compression tool applied connectors or exothermic welding process connectors or powder actuated compression tool applied connectors.
- B. Pipe Grounding Clamp: Mechanical ground connector with cable parallel or perpendicular to pipe.

#### 2.4 GROUNDING BUSBAR

A. Grounding Busbar: 1/4-inch thick by 4-inch high by 10-inch long copper grounding busbar with insulators that meet ANSI J-STD-607-A specifications. UL 467 listed. Hole patterns in busbar to accommodate two-hole lugs, four-hole configuration.

# 2.5 GROUNDING CONDUCTOR

A. Grounding Electrode Conductor: Soft-draw bare stranded copper for wire sizes larger than #10 AWG Bare. Solid copper for wire sizes #10 AWG and smaller.

B. Equipment Grounding Conductor: Green insulated, insulation type to match that of associated feeder or branch circuit wiring, size as indicated on drawings.

# PART 3 – EXECUTION

## 3.1 EXAMINATION

- A. Verify site conditions prior to beginning work.
- B. Verify that final backfill and compaction have been completed before driving rod electrodes.

# 3.2 INSTALLATION

- A. Concrete-Encased Electrode ("Ufer ground"):
  - 1. From service equipment ground bus provide grounding electrode conductor to footing/foundation rebar.
  - 2. Bond #4 grounding electrode conductor to one minimum 20-foot long, 0.5-inch diameter independent steel rebar(s).
  - 3. Protect grounding electrode conductor from footing/foundation to service equipment grounding bus with rigid PVC conduit where grounding electrode conductor passes through concrete floor or other concrete structure. Do not use rigid metal conduit for grounding electrode conductor protection.
  - 4. Coordinate bonding of rebar in base of building concrete footing with installer prior to placement of concrete.
- B. Ground Rod Electrode:
  - 1. Bond #6 grounding electrode conductor to driven ground rods as indicated on Drawings.
  - Tap at center ground rod and extend grounding electrode conductor to service grounding bus. Install grounding electrode conductor to service grounding bus in rigid PVC conduit for physical protection where grounding electrode conductor passes through concrete floor or other concrete structure.
- C. Metal Underground Water Service: Bond water service pipe to service equipment ground bus or to the grounding electrode system. Connect to water pipe on utility side of isolating fittings or meters, bond across water meters.
- D. Other Metal Piping Systems: Bond gas piping system, fire sprinkler piping system and other metal piping systems to service equipment ground bus or to the grounding electrode system.
- E. Raceways:
  - 1. Ground metallic raceway systems. Bond to ground terminal with code size jumper except where code size or larger equipment grounding conductor is included with circuit, use grounding bushing with lay-in lug.
  - 2. Connect metal raceways, which terminate within an enclosure but without mechanical connection to enclosure, by grounding bushings and ground conductor to grounding bus.

- 3. Where equipment supply conductors are in flexible metallic conduit, install stranded copper equipment grounding conductor from outlet box to equipment frame.
- 4. Install equipment grounding conductor, code size minimum unless noted on drawings, in metallic and nonmetallic raceway systems.
- F. Feeders and Branch Circuits:
  - 1. Provide continuous green insulated copper equipment grounding conductors for feeders and branch circuits.
  - 2. Where installed in a continuous solid metallic raceway system and larger sizes are not detailed, provide insulated equipment grounding conductors for feeders and branch circuits sized in accordance with the latest adopted edition of NEC Article 250, Table 250-122.
- G. Boxes, Cabinets, Enclosures and Panelboards:
  - 1. Bond equipment grounding conductors to enclosure with specified conductors and lugs. Install lugs only on thoroughly cleaned contact surfaces.
  - 2. Bond Sections of service equipment enclosure to service ground bus.
- H. Motors, Equipment and Appliances: Install code size equipment grounding conductor to (motor) equipment frame or manufacturer's designated ground terminal.
- I. Receptacles: Connect ground terminal of receptacle and associated outlet box to equipment grounding conductor. Self grounding nature of receptacle devices does not eliminate equipment grounding conductor bolted to outlet box.
- J. Separately Derived Systems: Ground each separately derived system per NEC Article 250.
- K. Corrosion inhibitors: Apply a corrosion inhibitor to contact surfaces when making grounding and bonding connections. Use corrosion inhibitor appropriate for protecting a connection between metals used.

# 3.3 FIELD QUALITY CONTROL

- A. Grounding system resistance to ground not to exceed 5 ohms. Make necessary modifications or additions to grounding electrode system for compliance. Submit final tests to assure that this requirement is met.
- B. Resistance of grounding electrode system: measure using a four-terminal fall-of-potential method as defined in IEEE 81. Take ground resistance measurements before electrical distribution system is energized and in normally dry conditions, not less than 48 hours after last rainfall. Take resistance measurements of separate grounding electrode systems before systems are bonded together below grade. Combined resistance of separate systems may be used to meet required resistance, but specified number of electrodes must still be provided.
- C. Inspect and test in accordance with NETA Standard ATS, Except Section 4.
- D. Perform inspections and tests listed in NETA Standard AB, Section 7.13.

END OF SECTION 26 05 26

# SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Steel slotted support systems.
  - 2. Aluminum slotted support systems.
  - 3. Nonmetallic slotted support systems.
  - 4. Conduit and cable support devices.
  - 5. Support for conductors in vertical conduit.
  - 6. Structural steel for fabricated supports and restraints.
  - 7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
  - 8. Fabricated metal equipment support assemblies.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Slotted support systems, hardware, and accessories.
    - b. Clamps.
    - c. Hangers.
    - d. Sockets.
    - e. Eye nuts.
    - f. Fasteners.
    - g. Anchors.
    - h. Saddles.
    - i. Brackets.
  - 2. Include rated capacities and furnished specialties and accessories.
- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
  - 1. Equipment supports.
    - a. Include design calculations and details of hangers.

## 1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified.
  - 2. For life-safety components required to function after an earthquake (such as fire-sprinkler systems, components that contain hazardous content, and storage racks in structures open to the public), the Component Importance Factor is 1.5. For other components, the Component Importance Factor is 1.0 unless the structure is in Seismic Use Group III and component is necessary for continued operation of facility or failure of component could impair continued operation of facility, in which case the Component Importance Factor is 1.5.
  - 3. Component Importance Factor: 1.5.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D 635.

# 2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-(10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
  - Manufacturers:

1.

- a. Allied Tube & Conduit
- b. B-line
- c. Thomas & Betts Corp.
- d. Or Approved Equal
- 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
- 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
- 4. Channel Width: Selected for applicable load criteria.
- 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
- 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
- 8. Protect finishes on exposed surfaces from damage.

- B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
  - 1. Manufacturers:
    - a. Cooper Industries Inc.
    - b. Haydon Corp.
    - c. Thomas & Betts Corp.
    - d. Or Approved Equal
  - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 3. Channel Material: 6063-T5 aluminum alloy.
  - 4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
  - 5. Channel Width: Selected for applicable load criteria.
  - 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  - 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least one surface.
  - 1. Manufacturers:
    - a. Allied Tube & Conduit
    - b. B-line
    - c. G-Strut
    - d. Or Approved Equal
  - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  - 3. Channel Width: Selected for applicable load criteria.
  - 4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
  - 5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
  - 6. Rated Strength: Selected to suit applicable load criteria.
  - 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Conduit and Cable Support Devices: Steel and malleable-**iron** hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

- 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
- 2. Manufacturers:
  - a. Hiliti, Inc
  - b. ITW Ramset
  - c. MKT Fastening LLC
  - d. Or Approved Equal
- 3. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
- 4. Manufacturers:
  - a. B-Line
  - b. Empire Tool and Man.
  - c. Hilti Inc.
  - d. Or Approved Equal
- 5. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
- 6. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
- 7. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
- 8. Toggle Bolts: Stainless-steel springhead type.
- 9. Hanger Rods: Threaded steel.

# 2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

# **PART 3 - EXECUTION**

## 3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  - 1. NECA 1.
  - 2. NECA 101
  - 3. NECA 102.
  - 4. NECA 105.
  - 5. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies if available.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

# 3.2 COORDINATION

- A. Coordinate with other trades that the following items are coordinated with each other, using input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Ductwork, piping, fittings, and supports.
  - 3. Structural members to which hangers and supports will be attached.
  - 4. Size and location of initial access modules for acoustical tile.
  - 5. Items penetrating finished ceiling, including the following:
    - a. Luminaires.
    - b. Air outlets and inlets.
    - c. Sprinklers.
    - d. Access panels.

# 3.3 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

- 4. To Existing Concrete: Expansion anchor fasteners.
- 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
- 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
- 7. To Light Steel: Sheet metal screws.
- 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

# 3.4 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

#### 3.5 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete.
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

## 3.6 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

# SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

# 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal conduits and fittings.
  - 2. Nonmetallic conduits and fittings.
  - 3. Metal wireways and auxiliary gutters.
  - 4. Nonmetal wireways and auxiliary gutters.
  - 5. Boxes, enclosures, and cabinets.
  - 6. Handholes and boxes for exterior underground cabling.

#### 1.3 **DEFINITIONS**

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

#### **PART 2 - PRODUCTS**

# 2.1 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:
  - 1. Manufacturers:
    - a. AFC Cable Systems
    - b. Allied Tube & Conduit
    - c. Western Tube and Conduit
    - d. Or Approved Equal

- 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 3. GRC: Comply with ANSI C80.1 and UL 6.
- 4. ARC: Comply with ANSI C80.5 and UL 6A.
- 5. IMC: Comply with ANSI C80.6 and UL 1242.
- 6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit, IMC.
  - a. Comply with NEMA RN 1.
  - b. Coating Thickness: 0.040 inch (1 mm), minimum.
- 7. EMT: Comply with ANSI C80.3 and UL 797.
- 8. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- 9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings:
  - 1. Manufacturers:
    - a. AFC Cable Systems
    - b. Allied Tube & Conduit
    - c. Western Tube and Conduit
    - d. Or Approved Equal
  - 2. Comply with NEMA FB 1 and UL 514B.
  - 3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 4. Fittings, General: Listed and labeled for type of conduit, location, and use.
  - 5. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
  - 6. Fittings for EMT:
    - a. Material: Steel.
    - b. Type: clamp/bolt-on.
  - 7. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
  - 8. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

# 2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Nonmetallic Conduit:
  - 1. Manufacturers:
    - a. AFC Cable Systems
    - b. Allied Tube & Conduit
    - c. Western Tube and Conduit
    - d. Or Approved Equal
  - 2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 3. Fiberglass:
- a. Comply with NEMA TC 14.
- b. Comply with UL 2515 for aboveground raceways.
- c. Comply with UL 2420 for belowground raceways.
- 4. ENT: Comply with NEMA TC 13 and UL 1653.
- 5. RNC: Type ÉPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- 6. LFNC: Comply with UL 1660.
- 7. Rigid HDPE: Comply with UL 651A.
- 8. Continuous HDPE: Comply with UL 651A.
- 9. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
- 10. RTRC: Comply with UL 2515A and NEMA TC 14.
- B. Nonmetallic Fittings:
  - 1. Manufacturers:
    - a. AFC Cable Systems
    - b. CANTEX INC
    - c. Thomas & Betts Corp.
    - d. Or Approved Equal
  - 2. Fittings, General: Listed and labeled for type of conduit, location, and use.
  - 3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
    - a. Fittings for LFNC: Comply with UL 514B.
  - 4. Solvents and Adhesives: As recommended by conduit manufacturer.

# 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- 1. Manufacturers:
  - a. B-Line
  - b. Hoffman
  - c. Square D
  - d. Or Approved Equal
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4X, unless otherwise indicated, and sized according to NFPA 70.
  - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

### 2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- 1. Manufacturers:
  - a. Allied Moulded Products

- b. Hoffman
- c. Or Approved Equal
- B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

# 2.5 BOXES, ENCLOSURES, AND CABINETS

- 1. Manufacturers:
  - a. B-Line
  - b. Hoffman
  - c. Square D
  - d. Or Approved Equal
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- K. Gangable boxes are allowed.

- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 & Type 3R, Type 4 with continuous-hinge cover with flush latch unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Plastic.
  - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- M. Cabinets:
  - 1. NEMA 250, Type & Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.
  - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
  - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
  - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
  - 1. Manufacturers:
    - a. Armorcast Products Comp.
    - b. Oldcastle Enclosure
    - c. Quazite
    - d. Or Approved Equal
  - 2. Standard: Comply with SCTE 77.
  - 3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
  - 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  - 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - 6. Cover Legend: Molded lettering, "ELECTRIC.".
  - 7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  - 8. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

## **PART 3 - EXECUTION**

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed Conduit: GRC.
  - 2. Concealed Conduit, Aboveground: EMT.
  - 3. Underground Conduit: RNC, Type EPC-40-PVC.
  - 4. Retain first option in first subparagraph below if raceway may be exposed to physical damage.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed, Not Subject to Physical Damage: EMT.
  - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
  - 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
    - a. Loading dock.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
  - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  - 6. Damp or Wet Locations: GRC.
  - 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  - 3. EMT: Use clamp/bolt-on, steel fittings. Comply with NEMA FB 2.10.
  - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

### 3.2 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D. Do not fasten conduits onto the bottom side of a metal deck roof.
- E. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hotwater pipes. Install horizontal raceway runs above water and steam piping.
- F. Complete raceway installation before starting conductor installation.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. Install no more than the equivalent of four 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- L. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
  - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
  - 5. Change from ENT to GRC before rising above floor.
- M. Stub-Ups to Above Recessed Ceilings:
  - 1. Use EMT, IMC, or RMC for raceways.

- 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- O. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- S. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- T. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- V. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- W. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where an underground service raceway enters a building or structure.
  - 3. Conduit extending from interior to exterior of building.
  - 4. Conduit extending into pressurized duct and equipment.
  - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
  - 6. Where otherwise required by NFPA 70.
- X. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- Y. Expansion-Joint Fittings:

- 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
- 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
  - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
  - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
  - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
- 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
- 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
- 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- Z. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches (915 mm of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- AA. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- BB. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- CC. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- DD. Locate boxes so that cover or plate will not span different building finishes.
- EE. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- FF. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- GG. Set metal floor boxes level and flush with finished floor surface.

HH. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

## 3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
  - 1. Excavate trench bottom to provide firm and uniform support for conduit.
  - 2. Install backfill.
  - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
  - 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  - 5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

### 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes with bottom below frost line.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### 3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

# 3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

### 3.7 **PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

## SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
  - 2. Sleeve-seal systems.
  - 3. Sleeve-seal fittings.
  - 4. Grout.
  - 5. Silicone sealants.
- B. Related Requirements:
  - 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fireresistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

## PART 2 - PRODUCTS

### 2.1 SLEEVES

- A. Wall Sleeves:
  - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
  - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
  - 1. Material: Galvanized sheet steel.
  - 2. Minimum Metal Thickness:
    - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
    - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

### 2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  - 1. Manufacturers:
    - a. CALPICO, Inc
    - b. Metraflex Co.
    - c. Proco Products
    - d. Or approved equal
  - 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Carbon steel.
  - 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

#### 2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
  - 1. Manufacturers:
    - a. HOLDRITE
    - b. Or approved equal

## 2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## 2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

## PART 3 - EXECUTION

# 3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
  - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
    - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
  - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  - 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
  - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
  - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

- 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
- 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boottype flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

## 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

### END OF SECTION 26 05 44

## SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Work Included:
  - 1. Nameplates and Labels
  - 2. Equipment Nameplates
  - 3. Device Labels and Conductor Markers

### 1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements (if available) apply to this Section.

## **1.3 REFERENCES AND STANDARDS**

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

## 1.4 SUBMITTALS

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).
- B. In addition, provide:
  - 1. Samples of Nameplates/Labels: One of each type.

### 1.5 QUALITY ASSURANCE

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).
- B. In addition, meet the following:
  - 1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
  - 2. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

### 1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

### PART 2 – PRODUCTS

## 2.1 MANUFACTURERS

A. General: Manufacturer's standard products of categories and types required for each

application as referenced in other Division 26, Electrical Sections. Where more than a single type is specified for application, provide single selection for each product category.

- B. Equipment Nameplates:
  - 1. B & I Nameplates
  - 2. Intellicum
  - 3. JBR Associates
  - 4. Or approved equivalent.
- C. Device Labels:
  - 1. Kroy
  - 2. Brady
  - 3. Or approved equivalent.

## 2.2 NAMEPLATES AND LABELS

- A. Nameplates: Engraving stock melamine or lamicoid plastic laminate in the size and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color), punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Provide 1/8-inch thick material.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch.
  - 3. Background Color: Black.
  - 4. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
  - 5. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or devices/equipment. Include center hole to allow attachment.
  - 6. Locations:
    - a. Each electrical distribution and control equipment enclosure.
    - b. Communication cabinets.
    - c. Transformers.
    - d. Disconnect switches and starters.

# 2.3 EQUIPMENT NAMEPLATES

- A. Engraved phenolic plastic, 1/16-inch thick with beveled edge border matching letter color. All upper case letters in engraver standard letter style. Embossed tape or dymo style labels, or similar, are not acceptable.
- B. Color:
  - 1. Normal (Utility): White letters on black background.
  - 2. Life Safety (Emergency Systems): Black letters on orange background
- C. Letter Size:

- 1. Use 1/2-inch letters minimum for identifying major equipment and loads, including switchgear, switchboards, etc.
- 2. Use 1/4-inch letters minimum for identifying panels, breakers, etc.
- 3. Use 3/16-inch minimum for identifying source, voltage, current, phase, and wire configurations.
- D. The Architect, Engineer, Commissioning Agent, and Owner reserve the right to make modifications to the nameplates as necessary.
- E. Nameplates: Engraving stock melamine or lamicoid plastic laminate, Federal Specification L-P-387, in the size and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color), punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Provide

1/8-inch thick material.

- 1. Letter Color: White.
- 2. Letter Height: 1/4-inch.
- 3. Background Color: Black.
- 4. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

## 2.4 DEVICE LABELS & CONDUCTOR MARKERS

- A. Extra strength, laminated, adhesive tape, with 3/16-inch black letters on clear background. Use only for identification of individual wall switches, receptacles, conductors in device outlet boxes (receptacles and switches), control device stations, etc. Indicate source panel and circuits. Wall switches with engraved buttons do not require labeling. Embossed tape style labels, or similar, are not acceptable.
- B. Label all junction boxes to show system identification, source circuit, or raceway origin. In finished areas, utilize device label. In unfinished areas or above ceilings, use of permanent ink marker is acceptable.
- C. Where labels are provided, write identical information in permanent ink marker on the backside of the cover.

### PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.
- B. Coordinate designations used on Drawings with equipment labels.

#### 3.2 INSTALLATION

- A. Install nameplates and labels parallel to equipment lines.
- B. Secure nameplates to equipment front using self-tapping stainless steel screws.

- C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify underground raceways using underground warning tape. Install one continuous tape per underground raceway at 6- to 8-inches below finish grade. Where multiple underground raceways are buried in a common trench and exceeds 16-inch width, install multiple warning tapes not over 10-inches apart (edge to edge) over the entire group of underground raceways.
- E. Identify empty conduit and boxes with intended use.
- F. Provide wire markers on each conductor for power, control, signaling and communications circuits.
- G. On the front of receptacle and switch finish plates, provide adhesive label with the circuit that each device is connected to.
- H. Verify emergency system distribution equipment nameplate colors with Architect/Owner.
- I. Locations:
  - 1. Switchgear, switchboards, sub-distribution switchboards, distribution panels, and branch panels.
  - 2. Main breakers and distribution breakers in switchgear, switchboards, and distribution panels.
  - 3. Equipment including, but not limited to, motor controllers, disconnects, and VFD's.
  - 4. Low-voltage equipment enclosures including, but not limited to, fire alarm panels, access control panels, and lighting control panels.
- J. Provide master nameplate at each incoming utility service to identify the following (each on a separate line):
  - 1. Serving Utility Transformer (ex. Utility Service #1.)
  - 2. Project
  - 3. Serving Utility Company
  - 4. Month and Year of Completion
  - 5. Voltage, Phase, and Wire Configuration.
- K. Switchgear, switchboards, and panels to include name source, voltage, current phase, wire configuration and fault current rating.
- L. Provide nameplates for flush mounted branch panelboards identifying name on front door. On inside of door provide nameplate as noted above.
- M. Provide a second label at branch panelboards listing the means of identification of branch circuit conductors. This identification legend to consist of the color code used for each voltage system (208Y/120V and 480Y/277V). See specification Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables, for required conductor color code for this project. Include identification of both voltage systems on each label, regardless of the voltage of the panelboard to which the label is affixed. Comply with requirements of NEC 210.5.

- N. Provide engraved nameplate similar to distribution panelboards for transformers, lighting control panels, contactors, relays, time switches, etc. identifying name, service point and circuit number.
- O. For flush mounted panelboards verify label location (inside or outside panelboard door) with Architect/Owner.
- P. Provide typewritten branch panel schedules with protective clear transparent covers accounting for every breaker installed. Use actual room designations assigned by name or number near completion of the work, and not the designations shown on drawings.
- Q. Provide labeling where switches control remote lighting or power outlets or where multiple switches are located in the same location.
- R. Where switches control remote lighting or power outlets, or where switches or outlets in same location serve different purposes, such as light, power, intercom, etc. or different areas, such as corridor and outside, plates with 1/8-inch black letters indicating function of each switch or outlet. Also label function light switches where two or more are mounted in same locations.
- S. Provide receptacle device plates with panel and circuit designation labeled on the face, with Dymo-type label.

## END OF SECTION 26 05 53

# SECTION 26 09 25 – DIGITAL LIGHTING CONTROLS

## PART 1 – GENERAL

### 1.1 SUMMARY

- A. Section includes:
  - 1. Digital network lighting control system.
- B. Related Sections.
  - 1. Section [26276 Wiring Devices]
  - 2. Section [265113 Interior Lighting Fixtures, Lamps, and Ballasts:] LED and Fluorescent lighting ballasts controlled by lighting control system.
  - 3. Section [260923 Lighting Control Devices:] Occupancy Sensors, Photocells and Digital Switches used in conjunction with lighting control system
- C. Contractor responsibilities:
  - 1. Coordinate, receive, mount, connect, and place into operation all equipment. Furnish all conduit, wire, connectors, hardware, and other incidental items necessary for the complete and properly functioning relay lighting control system as described herein and shown on the plans.

# 1.2 REFERENCES

- A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) C62.41-1991 — Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- B. ASTM International (ASTM)
  - 1. D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.
- C. Canadian Standards Association (CSA)
  - 1. CSA C22.2 # 14 Industrial Control Equipment
  - 2. CSA C22.2 # 184 Solid-State Lighting Controls
- D. International Electrotechnical Commission
  - 1. (IEC) 801-2 Electrostatic Discharge Testing Standard.
  - 2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations electronic switches.
- E. International Organization for Standardization (ISO)
  - 1. 9001:2000 Quality Management Systems.
- F. National Electrical Manufacturers Association (NEMA) WD1 (R2005) General Color Requirements for Wiring Devices.
- G. Underwriters Laboratories, Inc. (UL) ():
  - 1. 508 (1999) Standard for Industrial Control Equipment.
  - 2. 924 Standard for Safety of Emergency Lighting and Power Equipment
- H. American Society of Heating, Refrigerating and Air-Conditioning (ASHRAE)
  - 1. ASHRAE 90.1
- I. California Energy Commission (CEC)
  - 1. Title 24
- J. International Energy Conservation Code (IECC)
  - 1. IECC

# 1.3 SUBMITTALS

- A. Submit under provisions of Section [01 33 00] and in accordance with Conditions of the Contract. Submittal Set shall include the following:
  - 1. Bill of Materials: Complete list of all parts needed to fully install selected system components.
  - 2. System One-Line Diagram
  - 3. Device detail drawings providing wiring details and dimensional data.
  - 4. Product Data Sheets

# 1.4 CLOSEOUT SUBMITTALS

- A. To be provided within two weeks following system turn-on.
  - 1. Warranty documents specified herein.
  - 2. Three sets of operation and maintenance manuals.
  - 3. Two complete sets of as-built drawings

# 1.5 QUALITY ASSURANCE

- A. Manufacturer Requirements
  - 1. Continuously engaged in the manufacture of architectural lighting controls and relays for no less than ten years.
  - 2. Provide factory-direct technical support hotline 24 hours per day, 7 days per week.
  - 3. Maintain a quality system that is registered to the ISO 9001:2000 Quality Standard.
- B. Lighting control system components:
  - 1. Listed by UL specifically for the required loads, or certified by recognized independent testing organizations that test to UL standards.
    - a. UL508
    - b. UL916 listing not acceptable.
    - c. UL924
  - 2. Comply with ASHRAE 90.1
  - 3. Comply with Title 24, Part 6
  - 4. Comply with IECC
- C. Installer Qualifications
  - 1. Experienced in performing the work of this section
  - 2. Has specialized in installation of work similar to that required for this project.
- D. Source Limitations
  - 1. To assure compatibility, obtain all system components from a single source with complete responsibility for all lighting controls and accessories specified in this Section and elsewhere in Division 26 Section 09 "Lighting Controls." The use of subcontracted component assemblers is not acceptable.

# 1.6 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. LED Drivers
  - 1. Supply ballasts that are compatible with the network lighting control system.
  - 2. Accept 0 10V dimming control.
- B. Fluorescent Ballasts
  - 1. Supply ballasts that are compatible with the network lighting control system.
  - 2. Accept 0 10V dimming control.

C. All conduit, wire, connectors, hardware, and other incidental items necessary for the complete and properly functioning network lighting control system as described herein and shown on the plans.

# 1.7 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Division 1 Product Requirements Sections.
- B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery
  - 1. Deliver materials in manufacturer's original, unopened, undamaged packages with intact identification labels.
  - 2. Deliver to other trades in a timely manner.
- D. Storage and Protection: Store materials away from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

# 1.8 **PROJECT CONDITIONS**

- A. Do not install equipment until the following conditions can be maintained in spaces to receive equipment:
  - 1. Ambient temperature: 0° to 50° C (32° to 122° F).
  - 2. Relative humidity: Maximum 90 percent, non-condensing.
  - 3. Lighting control system must be protected from dust during installation.

# 1.9 WARRANTY

- A. Manufacturer's Warranty
  - 1. Warrant all equipment free of defects in materials and workmanship.
  - 2. Warranty Period
    - a. Warrant all system components for 25 months from date of shipment, or two years from date of turn-on, whichever occurs first.
    - b. Make extended warranties available.
  - 3. Warrant relay modules for a period of 10 years.
  - a. Provide replacement modules at no cost to Owner.
  - 4. Owner's Rights: Manufacturer's warranty is in addition to, not a limitation of, other rights the Owner may have under contract documents.

# PART 2 - PRODUCTS

# 2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturer: Leviton Manufacturing Co. Inc. System: Leviton GreenMAX DRC
- B. Basis of design product: Leviton Manufacturing Co. Inc. GreenMAX DRC or subject to compliance and prior approval with specified requirements of this section, one of the following:
  - 1. Leviton Manufacturing Co. Inc. GreenMAX DRC
  - 2. Or Approved Equal.
- C. Substitutions: Permitted.
  - 1. Show all substitutions as an add or deduct from the base bid price
    - a. All substitutions subject to provisions of Division 1.

- 2. Clearly delineate all proposed substitutions as such and submit in writing for approval by the design professional a minimum of 10 working days prior to the bid date.
  - a. Proposed substitutions must be made available to all bidders.
  - b. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
- 3. Prior to rough-in, provide complete engineered shop drawings, including power wiring, with deviations from the original design highlighted in an alternate color, to the engineer for review and approval.
- 4. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

# 2.2 **DESCRIPTION**

- A. Digital network lighting control system comprised of the following components:
  - 1. GreenMAX DRC Room Controller
  - 2. GreenMAX DRC App
  - 3. Remote load control Smart Packs
  - 4. Sapphire Touch Screen Room Controller
  - 5. Phase Control Dimmer
  - 6. Configurable relay cabinets
  - 7. Remote low voltage input cabinets
  - 8. Low voltage control devices
    - a. Including but not limited to digital switches, analog switches, occupancy sensors, and daylight sensors.
  - 9. Network Equipment:
    - a. Hubs, Switches, and Repeaters for connection of LumaCAN and Ethernet cabling.
    - b. Network Protocol Converters, (NPC), used for system integration as required by specific project plans.
    - c. Power Supplies

# 2.3 PERFORMANCE CRITERIA

- A. [Occupancy/Vacancy Sensing] [0-10V Dimming] [Daylight Harvesting] [Partial-ON] [Partial-OFF] [Demand Response] [Receptacle Control] [Manual Switching] to control lighting with the following hierarchy:
  - 1. Emergency: Highest priority, overrides all other inputs.
  - 2. Power failure: All RTC relays close upon loss of system power.
  - 3. Bypass Switches: Second priority, over-rides all other inputs except Emergency
- B. Room Controller Operation
  - 1. Programmable from WiFi network using the GreenMAX DRC App on an Android or iOS smart device
  - 2. Multi-location switching
  - 3. Occupancy/vacancy detection
    - a. Allow programming of each group with the following operational behaviors:
      - 1) Auto ON / Auto OFF
      - 2) Auto ON /Auto OFF with light hold off
      - 3) Manual ON / Auto OFF with light hold off
      - 4) Manual ON / Auto OFF
      - 5) Manual ON / Manual OFF
      - 6) Manual ON / Manual OFF with light hold off
      - 7) Set Light Hold (delay) Times from thirty (30) seconds to thirty 30)

# minutes

- 4. Multi-zone Daylight Harvesting
  - a. No limit to number of Zones.
  - b. Closed loop daylight harvesting
  - c. Eight (8) independent pairs of rising and falling trigger point values per photocell input.
  - d. Delay times of thirty (30) seconds to thirty (30) minutes
  - e. ON/OFF behavior
  - f. Auto ON with Manual Override
  - g. Blink Warn Sequence
- 5. Assign fixtures to a Group
  - a. System shall have the ability to assign fixtures to Groups.
- C. Digital switches
  - 1. Assign each button to individual fixtures or Groups
    - a. Programmable behaviors to include
      - 1) Scene
      - 2) Toggle
      - 3) Room ON
      - 4) Room OFF
      - 5) Group Raise / Group Lower
      - 6) Raise
      - 7) Lower
  - 2. Program delay time within each area or zone
    - a. Thirty (30) seconds to thirty (30) minutes

# 2.4 NETWORK PROTOCOLS

- A. Lumina RF
  - 1. Mesh network topology
- B. WiFi
  - 1. Connection to GreenMAX DRC App for wireless commissioning, configuration, control, monitoring and provisioning
  - 2. Connection to building network
- C. LumaCAN
  - 1. Daisy chain topology
  - 2. Maximum branch length of 1600 feet
    - a. Devices located at branch ends must have their termination jumpers in the ON position.
- D. Ethernet
  - 1. Command Modules only
  - 2. Can be configured as a bridge between LumaCAN branches
  - 3. Can be used as an Internet connection
    - a. Remote firmware upgrades, monitoring and programming possible via Internet
  - 4. Ethernet switches can be used to extend system coverage area by linking Command Modules
- E. BACnet IP
  - 1. Read-only device description for Relay Cabinets
    - a. For use with Building Management System (BMS) software that does not support writing of device descriptions.
  - 2. Re-name groups and relays via the BMS network, if it supports this function

- 3. Support all 16 BACnet priorities
  - a. Separate Priority Array for each relay
  - b. 1 is highest, 16 is lowest
  - c. Higher priority maintains control until a "relinquish" command is issued
  - d. Top three priority levels permanently assigned to Internal Main Bypass, Emergency Power and Internal Relay Bypass
  - e. Individual control of all other priorities
- 4. Support 252 Analog / Binary Outputs
- 5. Support 240 Analog / Binary Inputs

# 2.5 NETWORK CABLE

- A. LumaCAN: CAT6
- B. Ethernet: CAT5 or better
- C. BACnet IP: CAT5 or better
- D. Terminations: RJ45 connectors

# 2.6 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) ROOM CONTROLLER

- A. Coordinates all the energy management functions in a room as part of the GreenMAX DRC system.
- B. Performance Criteria
  - 1. GreenMAX DRC Room Controller shall be capable of the following applications:
    - a. Single room controller for GreenMAX DRC systems, coordinating all the energy management functions in a room
  - 2. Line voltage models UL924 listed
  - 3. Provide 0-10V control and power relay rated
- C. Physical
  - 1. Available in low voltage and line voltage models
    - a. Low voltage model can be surface mounted or installed in a DIN rail enclosure
    - b. Line voltage model provided in NEMA 1 enclosure with nipple mounting can install into a knockout or act as cover for a 4" square box
    - c. UL2043 Plenum rated
  - 2. Environmental
    - a. Operating Temperature: 32° to 122° F (0° to 50° C)
    - b. Ambient Humidity 0% to 90% non-condensing
- D. Electrical
  - 1. Supported and listed loads
    - a. 120 277VAC,16A LED Driver, Tungsten, Resistive, Electronic Ballast
    - b. 120 277VAC, 20A Ballast
    - c. 120VAC 1/2HP Motor, 277VAC 1HP Motor, 240VAC 1HP Motor
    - d. 120VAC, 20A General Purpose Plug Load Control.
  - 2. Input Voltage
    - a. Low Voltage: 18 24VDC
    - b. Line Voltage: 120 277VAC, 50/60Hz, 20A Max
    - c. Line Voltage: 347VAC, 60Hz, 20A Max.
  - 3. Control output
    - a. Class I or Class II 0-10V wiring. #18AWG stranded
    - b. 0-10V Sinking Control, 20A

- 4. Network Connections via LumaCAN wiring using CAT6 cable with RJ45 connectors.
- 5. Wireless Connections via Lumina RF and Intellect fixtures and WiFi to building networks
- E. Product Components
  - 1. Leviton GreenMAX DRC Room Controller, DIN Rail Form Factor, model #DRC00-0L0
  - 2. Leviton GreenMAX DRC Room Controller, 120-277VAC, model #DRC07-ED0
  - 3. Leviton GreenMAX DRC Room Controller, 347VAC, model #DRC00-030

# 2.7 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) SMART PACKS

- A. Remotely mounted network addressable load control relays allowing for a distributed system architecture.
- B. Performance Criteria
  - 1. DRC Smart Packs shall be capable of the following applications:
    - a. UL924 listed for use with Normal or Emergency loads
    - b. Standalone load control when used with a GreenMAX DRC or Sapphire Room Controller.
    - c. Remote relay when used with GreenMAX Lighting Control Panel
  - 2. Provide 0-10V dimming or switching control for all listed and compatible load types.
  - 3. Smart Pack relay shall be listed for use on Plug Load circuits.
  - 4. DRC Smart Pack shall provide two-way communication and metering relay capability and allow data to be collected over BACnet via connected devices.
- C. Physical
  - 1. Smart Pack provided in NEMA 1 enclosure with nipple mounting for use with standard junction box.
    - a. UL2043 Plenum rated.
    - b. Paintable for exposed ceiling installations
  - 2. Environmental
    - a. Operating Temperature: 23° to 122° F (-5° to 50° C)
    - b. Ambient Humidity 0% to 90% non-condensing
- D. Electrical
  - 1. Supported and listed loads
    - a. 120 277VAC,16A LED Driver, Tungsten, Resistive, Electronic Ballast
    - b. 120 277VAC, 20A Ballast
    - c. 120VAC 1/2HP Motor, 277VAC 1HP Motor, 240VAC 1HP Motor
    - d. 120VAC, 20A General Purpose Plug Load Control
  - 2. Input Voltage
    - a. 120 277VAC, 50/60Hz, 20A Max.
  - 3. Control output
    - a. Class I or Class II 0-10V wiring. #18AWG stranded
    - b. 0-10V Sinking control, 100mA
  - 4. Network Connections via LumaCAN wiring using CAT6 cable with RJ45 connectors.
- E. Product Components:
  - 1. Leviton DRC Smart Pack, model # DRD07-ED0

# 2.8 SAPPHIRE TOUCH SCREEN ROOM CONTROLLER

A. Provide a fully customizable touch screen based user interface as a component of the

GreenMAX DRC network lighting control system or as a standalone room control solution when used with GreenMAX DRC Smart Packs.

- B. Performance Criteria:
  - 1. 7" capacitive LCD Touch Screen providing the following configurable user interface components:
    - a. Tabs / Pages
    - b. Buttons
    - c. Sliders
  - 2. Integral 7-day scheduler:
    - a. Astronomical time clock
    - b. (2) Custom user defined holiday exception calendars
    - c. Special event calendar
  - 3. Two-way communication allows touch screen to update based on actual device status.
  - 4. Online / Offline configuration and screen design through PC tool.
  - 5. Controller shall provide password protected administration.
  - 6. Touch screen shall provide local low-voltage inputs for connection of occupancy and daylight sensors.
  - 7. Touch screen shall allow software and configuration updates through front panel via USB memory stick.
- C. Physical:
  - 1. Touch screen shall be installed in a standard 4-gang box with a 4-gang raised device cover.
  - 2. LCP panel shall be 7" diagonal, 16.9 form factor, 800x480 WVGA: 130° x 110° viewing angle with LED backlight and 24-bit color.
  - 3. Environmental:
    - a. Operating Temperature: 14° to 122° F, (-5° to 50° C)
    - b. Ambient Humidity: 0% to 90% non-condensing
  - 4. Color change kits available in White, Black, and Light Almond.
- D. Electrical
  - 1. Controller operates on +12-24VDC, Class II SELV on the digital LumaCAN network using CAT6 cable with RJ45 connectors.
  - 2. Power Supply
    - a. Power supplied to Touch Screen via the LumaCAN network or separate power supply. Device draws 1750mA, 200mA standby current.
- E. Product Components
  - 1. Leviton Sapphire LCD Touch Screen Room Controller, model # TS007-XXX

# 2.9 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) PHASE CONTROL DIMMER

- A. Incorporates switching and dimming of 2-wire phase control loads as part of a GreenMAX DRC system.
- B. Performance Criteria
  - 1. Provides 1-4 channels of forward or reverse phase control
  - 2. Shall provide amplify feature, allowing channels to be combined to increase output
- C. Physical
  - 1. DIN Rail mountable in Leviton DIN Rail Rack Mount Enclosures, series DINRK-XXX
  - 2. Environmental:
    - a. Operating Temperature: 32° to 140° F, (0° to 60° C)
    - b. Ambient Humidity: 0% to 90% non-condensing

- D. Electrical
  - 1. Input Voltage
    - a. 120 277VAC, 50/60Hz, 10A Max.
  - 2. Load Ratings
    - a. Supports LED, CFL, electronic ballast, magnetic ballast, cold cathode, transformer
  - 3. Network Connections via LumaCAN wiring using CAT6A cable with RJ45 connectors.
  - 4. Topology:
    - a. Daisy chain, 1600' max between repeaters
    - b. Home-run and networking length up to 10,000' can be achieved when using Leviton LumaCAN network repeaters, model # NPRPT
    - c. Maximum 110 nodes between repeaters
    - d. Maximum 250 nodes on a LumaCAN network
- E. Product Components
  - 1. Leviton GreenMAX DRC Phase Control Dimmer, model # DRDDP-A40

# 2.10 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) DIGITAL OCCUPANCY SENSORS

- A. Provides digital occupancy/vacancy and daylight sensing as part of the GreenMAX DRC System
- B. Performance Criteria
  - 1. Occupancy detection using PIR technology with a 450 sq. ft. field-of-view
  - 2. Light level detection up to 0 to 100 footcandles
  - 3. Configurable parameters for occupancy sensitivity, timeout, enable/disable and photocell range, enable/disable
- C. Physical
  - 1. Sensor shall combine both a PIR occupancy/vacancy sensor with a daylight sensing photocell
  - 2. Sensor shall be recess mounted into a 2" diameter hole
  - 3. Environmental
    - a. Operating Temperature: 32° to 122° F, (0° to 50° C)
    - b. Ambient Humidity 0% to 90% non-condensing
- D. Electrical
  - 1. LumaCAN powered, +12-24VDC, 40mA
- E. Product Components
  - 1. Leviton GreenMAX DRC Occupancy Sensor and Photocell, model #OSR05-ICW

# 2.11 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) DIGITAL SWITCHES

- A. Network addressable control stations providing local control of digital lighting control system as part of a GreenMAX DRC system.
- B. Performance Criteria:
  - 1. Used as primary user interface
  - 2. Can be used for multi-location control
  - 3. Each button shall be individually programmed for on, off, on/off, dimmed raise/lower, scene on level, and other customizable scenes and settings using the GreenMAX DRC App
- C. Physical:
  - 1. Available in One (1), two (2), four (4), or (8) button configurations.

- 2. Available in the following colors
  - a. White
  - b. Ivory
  - c. Light Almond
  - d. Gray
  - e. Red
  - f. Black
- 3. Custom Engraving
  - a. To be available for the following:
    - 1) Individual buttons
    - 2) Wallplates
- 4. Digital switches shall mount into a standard depth wallbox.
- 5. Environmental
  - a. Operating Temperature: 32° to 122° F, (0° to 50° C)
  - b. Ambient Humidity: 0% to 90% non-condensing
- D. Electrical:
  - 1. Digital stations powered by LumaCAN network through CAT6 cable and RJ45 connectors.
- E. Product Components:
  - 1. Leviton GreenMAX DRC Digital Switches, series DRKDN-CXW
  - 2. Leviton GreenMAX DRC Color Change Kit, series CKDNK-X0Y
  - 3. Leviton GreenMAX DRC Color Change Kit with Engraving, series CKDNK-XEY

# 2.12 GREENMAX RELAY CABINETS

- A. Digital Lighting Control panel consisting of Enclosure, Command Module, Relay Insert Panels, and Modular Relays capable of being field assembled without voiding UL listing.
- B. Performance Criteria

b.

- 1. Capacities
  - a. Eight (8), sixteen (16), thirty-two (32) or forty-eight (48) single- or dual-pole relays.
    - Optional Factory Installed Low Voltage Input cards
      - 1) Eight (8) or sixteen (16) inputs
- 2. Command Module
  - a. Field-installable and/or replaceable self-contained units with Emergency input.
    - Integral overload and short circuit protection provide separate overload protection for system processor and connected LumaCAN devices including Low Voltage Input Card.
  - b. Supplies power to all electronics in the Relay Cabinet
  - c. Supplies power to digital switches and Handheld Display Unit via LumaCAN
  - d. Can supply +24VDC to other low-voltage inputs
  - e. Can contain an optional Low Voltage Input (+24VDC) card suitable for termination of eight (8) or sixteen (16) low voltage inputs.
  - f. Emergency Signal Input
    - 1) Input for a hardwired emergency override signal
    - 2) Requires external contacts
    - 3) Activates Emergency status when a signal of +24VDC is present
    - 4) Releases Emergency status when signal falls to zero (0VDC).
  - g. Controls all relays as assigned by the user regardless of processor operation.
  - h. Provides +24VDC to external contacts
  - i. Low Voltage Input Card Option allows user to configure inputs as:

- 1) 0 to 10VDC analog
- 2) +24VDC switched
- 3) Contact closure.
- j. +24VDC power supply
  - 1) 70W (2.9 amperes) capacity
  - 2) Input devices can use external power supplies
- k. Compatible with the following devices
  - 1) Occupancy sensors
  - 2) Photocells
  - 3) GE switches
  - 4) External Contacts
  - 5) Multi-button low voltage switches
  - 6) ON/OFF dedicated button low voltage switches
- 3. Handheld Display Unit used for system configuration and monitoring.
  - a. Current Operating Status
  - b. Errors
  - c. Current Time
  - d. Alarms
  - e. Astronomical Time Clock settings
  - f. Monitor Menus
  - g. Control Menus
  - h. Configuration Menus
  - i. Remote Manual operation of all system relays
  - j. Inspection of both digital and low voltage inputs
    - 1) State
    - 2) Status
    - 3) Current value
  - k. Schedule monitoring and adjustment
  - 1. Temporary override of schedule on a day-by-day basis
- C. Physical
  - 1. Material
    - a. Steel
  - 2. Finishes
    - a. Leviton Standard Green.
  - 3. Removable locking hinged door.
    - a. Removing the door from its hinges shall not defeat the locking mechanism.
    - b. Able to be delivered empty of electronics
  - 4. Relay Insert Panel
    - a. Allow relays modules to be installed, removed and relocated without internal rewiring or mounting screws
- D. Electrical
  - 1. Grounding point provided in left wire-way
  - 2. Relays shall be rated to switch voltages from 24 to 277VAC and +24VDC.
  - 3. Short Circuit Current Rating (SCCR) of the assembled cabinet, regardless of its specific configuration, to be 25,000 Amperes at 277VAC.
  - 4. Command Module requires single-phase power supply, 120 / 277VAC.
- E. Product Components:
  - 1. GreenMAX enclosure with lockable hinged door.
  - 2. Command Module.
  - 3. Relay Insert Panels

4. Modular Relays, type per panel schedule

# 2.13 GREENMAX REMOTE LOW VOLTAGE INPUT CABINETS

- A. Remotely mounted network node providing additional Network power and local connection point for low voltage control devices.
- B. Performance Criteria:
  - 1. Fully functional as independent LumaCAN network nodes
    - a. Can be connect to network at any location: direct dedicated connection to a Relay Cabinet is not required
    - b. Eight (8) or sixteen (16) Low Voltage inputs
    - c. Provides power to LumaCAN digital devices
    - d. Provides a connection point for the HDU
- C. Physical:
  - 1. Surface mount enclosure
    - a. #16 US gage Steel
  - 2. Finishes
    - a. Leviton Standard Green.
    - Removable locking hinged door.
      - a. Removing the door from its hinges shall not defeat the locking mechanism
- D. Electrical

3.

- 1. Integrated power supply
  - a. Supply 100 277VAC
  - b. Rated output at 70W of +24VDC power via LumaCAN
  - c. Connected devices can be self-powered.
- E. Product Components
  - 1. GreenMAX Remote Low Voltage Input Cabinet, Model #:
    - a. RLV08-110 with (8) low voltage inputs
    - b. RLV16-110 with (16) low voltage inputs

# 2.14 GREENMAX DIGITAL SWITCHES

- A. Network addressable control stations providing local control of digital lighting control system.
- B. Performance Criteria:
- C. Physical:
  - 1. Button Stations available in One (1), two (2), four (4), or (8) button configurations.
  - 2. Key station available in single-operator stainless steel configuration.
  - 3. Button stations available in the following colors
    - a. White
    - b. Ivory
    - c. Light Almond
    - d. Gray
  - 4. Custom Engraving
    - To be available for the following:
      - 1) Individual buttons
        - 2) Station wallplates
    - b. Engraved characters to be of a contrasting color as shown on drawings
- D. Electrical:

a.

1. Digital stations powered by LumaCAN network through CAT6 cable and RJ45

connectors.

- 2. RJ45 connections available on each device:
  - a. LumaCAN input
  - b. LumaCAN throughput
  - c. Hand Held Display Unit access to entire network
- E. Product Components:
  - . GreenMAX Digital Switches, series RLVSW-XXX

# PART 3 – EXECUTION

# 3.1 INSTALLATION

- A. Coordinate, receive, mount, connect, [and place into operation] all equipment.
- B. Install equipment in accordance with manufacturer's installation instructions.
- C. Provide complete installation of system in accordance with Contract Documents.
- D. Maintain performance criteria stated by the manufacturer without defects, damage, or failure.
- E. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.
- F. Ensure that daylight sensor placement minimizes sensors view of electric light sources; ceiling mounted and fixture-mounted daylight sensors shall not have direct view of luminaries.
- G. Furnish all conduit, wire, connectors, hardware, and other incidental items necessary for a properly functioning lighting control and relay system as described herein and shown on the plans. The Electrical Contractor shall maintain performance criteria stated by the manufacturer without defects, damage, or failure.
- H. Compliance: Contractor shall comply with manufacturer's product data, including shop drawings, technical bulletins, product catalog installation instructions, and product carton instructions for installation.
- I. Circuit Testing: The contractor shall test that all branch load circuits are operational before connecting loads to system load terminals, and then de-energize all circuits before installation.
- J. Application of Power: Power shall not be applied to the relay system during construction and prior to turn-on unless specifically authorized by written instructions from the manufacturer.
- K. [Programming: Program [low-voltage] [and] [digital switch] functionality remotely from the GreenMAX DRC App.]
  - 1. Terminate and test all network cable assemblies. Each field installed RJ45 connection must be tested prior to system interconnection. A test report must be furnished to factory-certified service engineer prior to scheduling commissioning activity.

# 3.2 SITE VERIFICATION

A. Verify that wiring conditions, which have been previously installed under other sections or at a previous time, are acceptable for product installation in accordance with manufacturer's instructions.

# 3.3 FIELD MEASUREMENTS

A. The electrical contractor shall be responsible for field measurements and coordinating the physical size of all equipment with the architectural requirements of the spaces into which they are to be installed.

# 3.4 INSPECTION

A. Inspect all material included in this contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.

# 3.5 SITE PROTECTION

A. Contractor shall protect installed product and finished surfaces from damage during all phases of installation including storage, preparation, testing, and cleanup.

# 3.6 COMMISSIONING

- A. Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters:
  - 1. Certified by the equipment manufacturer on the system installed.
  - 2. Site visit activities:
    - a. Verify connection of power feeds and load circuits.
    - b. Verify connection of controls.
    - c. Verify system operation control by control, circuit by circuit.
    - d. Obtain sign-off on system functions.
    - e. Demonstrate system capabilities, operation and maintenance and educate Owner's representative on the foregoing.
  - 3. At least three site visits to accomplish the following tasks:
    - a. Prior to wiring
- 1) Review and provide installer with instructions to correct any errors in the following areas:
  - a) Low voltage wiring requirements
  - b) Separation of high and low voltage wiring runs
  - c) Wire labeling
  - d) Load schedule information
  - e) Switching cabinet locations and installation
  - f) Physical locations and network addresses of controls
  - g) Ethernet connectivity
  - h) Computer-to-network connections
  - i) Load circuit wiring
  - j) Connections to other systems and equipment
  - k) Placement and adjustment of Occupancy Sensors
  - I) Placement and adjustment of Photocells
- b. After system installation
  - 1) Check and approve or provide correction instructions on the following:
    - a) Connections of power feeds and load circuits
    - b) Connections and locations of controls
    - c) Connections of low voltage inputs
    - d) Connections of the data network
  - 2) Turn on system control processor and upload any preprogrammed system configuration
  - 3) Verify cabinet address(es)
  - 4) Upload pre-programmed system configuration and information to switching and/or dimming cabinets
  - 5) Check load currents and remove bypass jumpers

- 6) Verify that each system control is operating to specification
- 7) Verify that each system circuit is operational according to specification
- 8) Verify that manufacturers' interfacing equipment is operating to specification
- 9) Verify that any computers and software supplied by the manufacturer are performing to specifications
- 10) Verify that any remote WAN (Wide Area Network) connections are operating properly
- 11) Have an owner's representative sign off on the abovelisted system functions
- c. Before project completion and hand-off
  - 1) Demonstrate system capabilities and functions to owner's representative
  - 2) Train owner's representative on the proper operation, adjustment, and maintenance of the system.
- B. Notification: Upon completion of the installation, the contractor shall notify the manufacturer that the system is ready for formal checkout. Notification shall be given in writing a minimum of 21 days prior to the time factory-trained personnel are required on site. Each field installed RJ45 connection must be tested prior to system interconnection. A test report must be furnished to manufacturer prior to scheduling commissioning activity. Manufacturer shall have the option to waive formal turn-on.
- C. Turn-On: Upon completion of all line, load and interconnection wiring, and after all fixtures are installed and lamped, Manufacturer's Rep or, if waived, Contractor shall completely check the installation prior to energizing the system. Each installed relay system shall be tested for proper ON/OFF operations, and proper LED illumination. Each installed control cabinet shall be tested verifying that each controlled load adjusts to the selected setting and that all switch LED's illuminate properly.
- D. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

# 3.7 MAINTENANCE

- A. Enable the end user to order new equipment for system expansion, replacements, and spare parts.
- B. Make new replacement parts available for a minimum of ten years from the date of manufacture.
- C. Provide factory-direct technical support hotline 24 hours per day, 7 days per week.
- D. Offer renewable annual service contracts, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system commissioning.

# END OF SECTION 26 0925

#### **SECTION 26 24 16 - PANELBOARDS**

#### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Work Included:
  - 1. Power Distribution Panelboards
  - 2. Panelboards
  - 3. Surge Protective Devices

### 1.2 RELATED SECTIONS

- A. Contents of Division 26, Electrical and Division 01, General Requirements (if available) apply to this Section.
- B. In addition, reference the following:
  - 1. Section 26 24 13, Switchboards.

## 1.3 REFERENCES AND STANDARDS

- A. References and Standards as required by Section 26 05 00, Common Work Results for Electrical and Division 01, General Requirements (if available).
- B. In addition, meet the following:
  - 1. UL 67, Standards for Panelboards.

# 1.4 SUBMITTALS

A. Submittals as required by Section 26 05 00, Common Work Results for Electrical and Division 01, General Requirements (if available).

#### 1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 05 00, Common Work Results for Electrical and Division 01, General Requirements (if available).

### 1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 05 00, Common Work Results for Electrical and Division 01, General Requirements (if available).

### **PART 2 – PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Eaton Electric
- B. GE Industries
- C. Square D

- D. Or approved equivalent.
- E. Manufacturers listed above are allowed on condition of meeting specified conditions including available space for equipment, Code required working clearances, and selective coordination per Section 26 05 73, Electrical Distribution System Studies can be met. Prior to submitting bid, manufacturer to provide documentation to Engineer verifying specific conditions, including those mentioned above, can be met. Remove and replace electrical equipment installed, at no cost to the Owner, that does not meet these conditions.
- F. Basis of Design: Eaton. Manufacturers listed are allowed on condition of meeting specified conditions including available space for the equipment and Code required working clearances and selective coordination. Remove and replace electrical equipment installed that does not meet these conditions at no cost to Owner.

## 2.2 POWER DISTRIBUTION PANELBOARDS

- A. Description: NEMA PB 1 Type 1 or Type 3R, circuit breaker type.
- B. Integrated Equipment Rating: Provide fully rated integrated equipment rating greater than the available fault current. Series rated panelboards are not acceptable. Reference drawings for available fault current. If drawings do not have available fault current shown, then coordinate with serving electrical utility.
- C. Panelboard Bus: Non-reduced Copper, ratings as indicated on drawings. Bus bar with suitable electroplating (tin) for corrosion control at connection. Provide copper ground bus in each panelboard.
- D. Lugs: Mechanical type for copper conductors.
- E. Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole; UL listed. For air conditioning equipment branch circuits provide circuit breakers UL listed as Type HACR.
- F. Molded Case Circuit Breakers with Current Limiters: With replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole; UL listed.
- G. Current Limiting Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole: UL listed. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.
- H. Solid-State Molded Case Circuit Breakers: With electronic sensing, timing and tripping circuits for adjustable current settings; UL listed.
  - 1. Ground fault trip, ground fault sensing integral with circuit breaker.
  - 2. Instantaneous trip.
  - 3. Adjustable short time trip.
  - 4. Adjustable long time delay.
  - 5. Adjustable short time delay.
  - 6. Adjustable short time pickup.
  - 7. Stationary mounting.

- 8. Include shunt trip where indicated.
- I. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.
- J. Fully equip unused spaces for future devices, including manufacturer required connections and mounting hardware.
- K. Cabinet Front: Surface type hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

## 2.3 PANELBOARDS

- A. Description: Panelboards 400 amps or less. NEMA PB1, Type 1 as indicated on drawings, circuit breaker type. Maximum enclosure depth: 6-inches for surface mounted, 5 3/4-inches for flush mounted.
- B. Maximum Width: 20-inches.
- C. Integrated Equipment Rating: Provide fully rated integrated equipment rating greater than the available fault current. Series rated switchboards are not acceptable. Reference drawings for available fault current. If drawings do not have available fault current shown, then coordinate with serving electrical utility. Final rating based on the protective device study completed under the provisions of Division 26, Electrical Distribution System Studies.
- D. Panelboard Bus Non-Reduced: Copper, ratings as indicated on drawings. Bus bar with suitable electroplating (tin) for corrosion control at connection. Provide copper ground bus in each panelboard; provide isolated ground bus where scheduled. Provide 200 percent rated copper neutral bus where scheduled.
- E. Lugs: Mechanical type for both aluminum and copper conductors.
- F. Provide double lugs and/or feed-through lugs for feed through feeders.
- G. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, plug-in type, with common trip handle for poles; UL listed. Predrill bus for bolt-on breakers.
  - 1. Type SWD for lighting circuits.
  - 2. Type HACR for air conditioning equipment circuits.
  - 3. Class A ground fault interrupter circuit breakers where scheduled.
  - 4. Class B ground fault equipment protection circuit breakers for heat trace and other circuits as required by Code. Provide shunt trip circuit breakers where scheduled; provide wiring to remote trip switch/contacts as indicated on Drawings.
  - 5. Do not use tandem circuit breakers.
  - 6. Combination AFCI Breaker: UL 1699 compliant. Integral 30mA GFCI trip. Manual test button for AFCI mechanism. Self-testing, tripping if AFCI module fails.
- H. Current Limiting Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole; UL listed. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.
- I. Solid-State Molded Case Circuit Breakers: With electronic sensing, timing and tripping
circuits for adjustable current settings; UL listed.

- 1. Ground fault trip, ground fault sensing integral with circuit breaker.
- 2. Instantaneous trip.
- 3. Adjustable short time trip.
- 4. Adjustable long time delay.
- 5. Adjustable short time delay.
- 6. Adjustable short time pickup.
- 7. Stationary mounting.
- 8. Include shunt trip where indicated.
- J. Accessories: Provide where indicated: shunt trip, arc-fault circuit interrupter (AFCI), Class A ground fault circuit interrupter (GFCI), auxiliary switch and alarm switch.
- K. Cabinet Front: Provide flush or surface mounting as shown on the schedules, drawings, or otherwise noted. Cabinet front with concealed hinged front cover door-in-door construction, metal directory frame with heavy clear plastic protector, flush lift latch and lock, two keys (CAT 70 keys) per panel all keyed alike.
- L. Provide boxes with removable blank end walls and interior mounting studs. Provide interior support bracket for ease of interior installation.
- M. Furnish surface mounted cabinet boxes without knockouts.
  - 1. Minimum Integrated Short Circuit Rating:
    - a. 10,000 amperes symmetrical for 240 V panelboards.
    - b. Minimum rating as indicated on the Drawings or Panel Schedules.
    - c. Final rating based on the Protective Device Study completed under the provisions of Section 26 05 73, Electrical Distribution System Studies.

### 2.4 SURGE PROTECTIVE DEVICES

A. See 26 43 00, Surge Protective Devices (SPD).

### PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1, NECA 1 and manufacturers installation instructions.
- B. Install panelboards level and plumb. Install recessed panelboards flush with wall finishes.
- C. Height: 6-feet 6-inches to top of panelboard; install panelboards taller than 6-feet 6-inches with bottom no more than 4-inches above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. Include all "spaces" and "spares." Revise directory to reflect circuiting changes and as-installed conditions. Use final Owner designated room names and numbers, and not designations shown on drawings.

- F. Provide engraved plastic nameplates per Section 26 05 53, Identification for Electrical Systems.
- G. Provide arc flash warning labels.
- H. Provide 1 (qty), 1-inch spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
- I. Provide permanent identification number in or on panelboard dead-front adjacent to each breaker pole position. Horizontal centerline of numbers to correspond with centerline of circuit breaker pole position.
- J. Ground and bond panelboard enclosure per NEC.
- K. Paint:
  - 1. Standard factory finish unless noted otherwise.
- L. Provide handle guards on each circuit supplying obviously constant loads such as fire alarm, security, lighting controls, refrigerators and freezers, fire protection, etc.
- M. Provide interior wiring diagram, neutral wiring diagram, UL label, and short circuit rating on interior or in booklet format inserted in sleeve inside panel cover.
- N. Verify available recessing depth and coordinate wall framing with other divisions.
- O. Shunt Trip Circuit Breakers: Provide wiring to remote trip switch/contacts as indicated on Drawings.
- P. Maintain fire rating of wall where panels are installed flush in fire rated walls.

### 3.2 FIELD QUALITY CONTROL

A. Perform inspections and tests in accordance with manufacturer's requirements.

### 3.3 CLEANING

- A. Thoroughly clean exterior and interior of each panelboard in accordance with manufacturer's installation instructions.
- B. Vacuum construction dust, dirt, and debris out of each panelboard.
- C. Where enclosure finish is damaged, touch up finish with matching paint in accordance with manufacturer's specifications and installation instructions.

### END OF SECTION 26 24 16

### SECTION 26 27 26 - WIRING DEVICES

### PART 1 – GENERAL

### 1.1 SUMMARY

- A. Work Included: Provision of materials, installation and testing of:
  - 1. Wall Switches
  - 2. Receptacles
  - 3. Finish Plates
  - 4. Wall Dimmers
  - 5. Surface Covers

### 1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements (if available) apply to this Section.

### 1.3 REFERENCES AND STANDARDS

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).
- B. In addition, meet the following:
  - 1. UL 498, Attachment Plugs and Receptacles.
  - 2. UL 943, Ground Fault Circuit Interrupters (Class A GFCI).
  - 3. UL 1472, Standard for Solid State Dimming Controls.

## 1.4 SUBMITTALS

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).
- B. In addition, provide:
  - 1. Wall switches and Dimmers
  - 2. Receptacles
  - 3. Wall Plates
  - 4. In-Use Cover

## 1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

## 1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

# PART 2 – PRODUCTS

## 2.1 MANUFACTURERS

- A. Wall Switches:
  - 1. Toggle Type Characteristics:
    - a. Leviton 1221
    - b. Pass & Seymour PS20AC1
    - c. Hubbell HBL 1221
    - d. Or approved equivalent.
  - 2. Decorative AC Rocker Switch Characteristics:
    - a. Hubbell
    - b. Leviton
    - c. Pass and Seymour
  - 3. Timer Switches:
    - a. WattStopper TS-400
    - b. Or approved equivalent.
  - 4. Momentary Center Off:
    - a. Leviton 1257
    - b. Or approved equivalent.
  - 5. Pilot Light Switches:
    - a. Leviton 1221-PL
    - b. Pass & Seymour PS20AC1CPL
    - c. Hubbell HBL 1221-PL
    - d. Or approved equivalent.
  - 6. Lighted Handle Switches:
    - a. Hubbell
    - b. Leviton
    - c. Cooper
    - d. Pass & Seymour
    - e. Or approved equivalent.
  - 7. Key Switches:
    - a. Pass & Seymour PS20AC1-L
    - b. Hubbell HBL 1221-L
    - c. Leviton 1221-2L
    - d. Or approved equivalent.
- B. Receptacles:
  - 1. Commercial Grade 20 Amp:
    - a. Cooper 5362
    - b. Hubbell 5362
    - c. Bryant 5352
    - d. Leviton 5362S
    - e. Pass & Seymour 5362
    - f. Or approved equivalent.
  - 2. Light Duty Commercial Grade:
    - a. 20 Amp:

- 1) Hubbell BR20
- 2) Bryant BRS20
- 3) Or approved Equivalent.
- b. Decorative Type 20 Amp:
  - 1) Cooper 6362
  - 2) Hubbell DR20
  - 3) Leviton 16342
  - 4) Pass & Seymour 26852
  - 5) Or approved equivalent.
- 3. Specification Grade USB Charger Tamper-Resistant Duplex 20 Amp:
  - a. Cooper TR 7746
  - b. Hubbell USB2OX2
  - c. Leviton T5832-T
  - d. Or approved equivalent.
- 4. Ground Fault Circuit Interrupter (GFCI) Receptacle:
  - a. Hubbell GFR5362SB
  - b. Cooper WRVGF20
  - c. Pass & Seymour 2095TRWR
  - d. Or approved equivalent.
- 5. While-in-Use Weatherproof Cover:
  - a. UV Stabilized Polycarbonate Cover:
    - 1) Pass & Seymour
    - 2) Intermatic
    - 3) Hubbell
    - 4) Cooper
    - 5) Or approved equivalent.
  - b. Thermoplastic Cover:
    - 1) Leviton
    - 2) Hubbell
    - 3) Or approved equivalent.
  - c. Die Cast Cover:
    - 1) Intermatic
    - 2) Hubbell
    - 3) Cooper
    - 4) Or approved equivalent.
- C. Wall Dimmers:
  - 1. WattStopper/Legrand
  - 2. Lutron NT Series
  - 3. Or approved equivalent.
- D. Surface Covers:
  - 1. Aluminum with Gasket, Blanks, Single Gang:
    - a. Bell 240-ALF
    - b. Carlon
    - c. Or approved equivalent.
  - 2. 2-Gang:
    - a. Bell 236-ALF

- b. Carlon
- c. Or approved equivalent.
- E. Provide lighting switches and receptacles of common manufacturer and appearance.

## 2.2 WALL SWITCHES

- A. Characteristics: Toggle type, quiet acting, 20 amp, 120/277 volt, UL listed for motor loads up to 80 percent of rated amperage, extra heavy duty.
- B. Timer Switches: Digital time switch to automatically turn light off after set time. Adjustable time setting from five minutes to 12 hours. LCD to show time remaining. 20-amp/120 to 277 volt.
- C. Momentary Center Off: Toggle type, quiet acting, 20-amp/120/277 volt, double throw momentary contact, center off position.
- D. Pilot Light Switches: Lighted handle, toggle type, red unless noted otherwise, neon pilot lamp. Pilot lamp energized when load is energized. 20 amp/120, 208 and 277 volt.
- E. Lighted Handle Switches: Lighted handle, quiet acting, 20 amp, 120/277 volt, toggle type, red unless noted otherwise neon lamp. Lamp energized when load is not energized.
- F. Key Switches: 20 amp/120-277 volt, black key guide.
- G. Finish: White.

## 2.3 RECEPTACLES

- A. Duplex Receptacles Characteristics: Straight parallel blade, 125 volt, 2 pole, 3 wire grounding.
  - 1. Commercial Grade: Riveted. Back and side wired. Brass ground contact on steel strap. Nylon face and nylon base. 20 amp.
- B. Isolated Ground Receptacle: Isolated ground "delta" on receptacle face, same finish as standard duplex receptacles, 20 amp.
- C. Ground Fault Circuit Interrupter (GFCI) Receptacle: Feed through type, back-and-side wired, tamper-resistant, weather resistant self-testing, 20 amp, 125VAC.
- D. While-in-Use Weatherproof Cover: NEMA 3R when closed over energized plug. Vertical mount for duplex receptacle. Provide continuous use cover with cover capable of closing over energized cord cap with bottom aperture for cord exit.
  - 1. UV stabilized polycarbonate cover with closed cell neoprene foam gasket.
  - 2. Thermoplastic cover with closed cell neoprene gasket.
  - 3. Die cast cover with closed cell neoprene foam gasket: Capable of being locked closed to prevent tampering or unauthorized use.
- E. Special Purpose Receptacles: Reference Drawings for NEMA Standard Specification.
- F. Finish:

- 1. Same exposed finish as switches.
- 2. Receptacles connected to emergency circuits life safety to have red finish.
- 3. Receptacles installed in surface raceway to match raceway finish. See Section 260533, Raceways.
- 4. Receptacles connected to isolated ground to have orange finish.

### 2.4 FINISH PLATES

A. Finish Plates: Type 302 stainless steel. Smooth satin finish.

### 2.5 WALL DIMMERS

A. Provide wall dimmers compatible with type of load controlled (i.e. line voltage, low voltage, 2-wire, 3-wire, 0-10v). Finish to match wall switches. Size dimmers to accept connected load. Do not cut fins. Where dimmers are ganged together, provide a single multi gang coverplate.

## 2.6 SURFACE COVERS

- A. Material: Galvanized steel, 1/2-inch raised industrial type with openings appropriate for devices installed on surface outlets.
- B. Cast Box and Extension Adaptors: Aluminum with gasket, blanks single gang or 2gang.

### **PART 3 – EXECUTION**

### 3.1 PREPARATION

- A. Protection:
  - 1. Devices: Upon installation of finish plates and receptacles, adhere to proper and cautious use of convenience outlets. At time of substantial completion, replace those items which have been damaged, including those burned and scored by faulty receptacles or cord caps.
  - 2. Finish Plates and Devices: Do not install items until finish painting is complete. Scratched or splattered finish plates and devices not acceptable.

### 3.2 INSTALLATION

- A. See Architectural elevations for location and mounting height of wiring devices. Review Architectural elevations prior to rough-in and contact Architect immediately if conflicts are found between Architectural and Electrical Drawings. Do not rough-in devices until conflicts are resolved.
- B. Install wiring devices and finish plates plumb with building lines, equipment cabinets and adjacent devices. Devices not plumb will be fixed at no additional cost to Owner.
- C. Orientation:
  - 1. Wall-Mounted Receptacles: Install with long dimension oriented vertically at centerline height shown on drawings or as specified.

- 2. Vertical Alignment: When more than one outlet is shown on drawings in close proximity to each other, but at different elevations, align outlets on a common vertical center line for best appearance. Verify with Architect.
- 3. Horizontal Alignment: When more than one outlet is shown on Drawings to be stacked in wall vertically, align outlets on a common horizontal center line for best appearance. Verify with Architect.
- D. GFCI Outlets: One GFCI receptacle may be used to provide GFCI protection to downstream duplex receptacles on same branch circuit. If GFCI receptacle is used, the following conditions must be met:
  - 1. Downstream receptacles are in same room as upstream GFCI duplex receptacles.
  - 2. Downstream duplex receptacles are labeled as being protected by an upstream GFCI receptacle in same room.
- E. AFCI Outlets: One AFCI receptacle may not be used to provide AFCI protection to downstream receptacles.

## 3.3 LABELING

- A. Provide labeling per Section 26 05 53, Identification for Electrical Systems.
- B. Provide receptacle device plates with panel and circuit designation labeled on the face, with Dymo-type label.

## 3.4 TESTING

- A. Submit report of compliance and results of receptacle and equipment tests:
- B. Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements. Test receptacles for line to neutral, line to ground and neutral to ground faults. Correct any defective wiring.

### END OF SECTION 26 27 26

**SECTION 26 28 13 - FUSES** 

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Cartridge fuses rated 600 V ac and less for use in the following:
    - a. Control circuits.
    - b. Motor-control centers.
    - c. Panelboards.
    - d. Switchboards.
    - e. Enclosed controllers.
    - f. Enclosed switches.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
  - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
    - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
  - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
  - 3. Fuse sizes for elevator feeders and elevator disconnect switches.

## 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. Include the following:
  - 1. Ambient temperature adjustment information.
  - 2. Current-limitation curves for fuses with current-limiting characteristics.
  - 3. Coordination charts and tables and related data.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

### 1.6 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers:
  - 1. Bussmann
  - 2. Edison
  - 3. Littelfuse
  - 4. Or Approved Equal.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

### 2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
  - 1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC.
  - 2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC.
  - 3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting.
  - 4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, fast acting.
  - 5. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
  - 6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.
  - 7. Type T: 250-V, zero- to 1200-A, 600-V, zero- to 800-A rating, 200 kAIC, very fast acting, time delay.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
  - 1. Feeders: Class L, fast acting, Class RK1, fast acting, Class RK5, fast acting, Class J, fast acting, Class J, time delay.
  - 2. Motor Branch Circuits: Class RK1 or Class RK5, Class CC, motor duty, time delay.
  - 3. Large Motor Branch (601-4000 A): Class L, time delay.
  - 4. Power Electronics Circuits: Class J, high speed or Class T, fast acting.
  - 5. Other Branch Circuits: Class RK1, time delay, Class RK5, time delay, Class J, fast acting, Class J, time delay, Class CC, fast acting.
  - 6. Control Transformer Circuits: Class CC, time delay, control transformer duty.
  - 7. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

### 3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

## 3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

### END OF SECTION 26 28 13

# SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

## PART 1 – GENERAL

### 1.1 SUMMARY

- A. Work Included:
  - 1. Toggle Type Disconnect Switches
  - 2. Manual Motor Starters
  - 3. Safety Switches
  - 4. Enclosed Circuit Breakers
  - 5. Molded Case Switches

### 1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements (if available) apply to this Section.

## 1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

## 1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

### 1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

### 1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

### PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Toggle Type Disconnect Switches:
  - 1. Cooper
  - 2. Hubbell
  - 3. Leviton
  - 4. Pass & Seymour
  - 5. Slater

- 6. Or approved equivalent.
- B. Manual Motor Starters:
  - 1. Eaton Electrical
  - 2. General Electric
  - 3. Square D
  - 4. Or approved equivalent.
- C. Safety Switches:
  - 1. Eaton Electrical
  - 2. GE Industrial
  - 3. Square D
  - 4. Or approved equivalent.
- D. Enclosed Circuit Breakers:
  - 1. Eaton Electrical
  - 2. GE Industrial
  - 3. Square D
  - 4. Or approved equivalent.
- E. Molded Case Switches:
  - 1. Eaton Electrical
  - 2. General Electric
  - 3. Square D
  - 4. Or approved equivalent.

## 2.2 TOGGLE TYPE DISCONNECT SWITCHES

- A. Rating: 120 or 277 volt, 1 or 2 pole, 20 amp, 1 hp maximum.
- B. Enclosure:
  - 1. NEMA 1: Dry locations/Indoors.
  - 2. NEMA 3R: Damp or wet locations/Outdoors.
- C. Handle lockable in 'off' position.

## 2.3 MANUAL MOTOR STARTERS

- A. Quick-Make, Quick-Break. Thermal overload protection. Device labeled with maximum voltage, current, and horsepower.
- B. Enclosure:
  - 1. NEMA 1: Dry locations/Indoors.
  - 2. NEMA 3R: Damp or wet locations/Outdoors.
- 2.4 SAFETY SWITCHES

- A. Heavy duty fusible type and non-fusible type (as indicated on drawings), dual rated, quick-make, quick-break with fuse rejection feature for use with Class R fuses only, unless other fuse type is specifically noted.
- B. Clearly marked for maximum voltage, current, and horsepower.
- C. Operable handle interlocked to prevent opening front cover with switch in 'on' position.
- D. Switches rated for maximum available fault current.
- E. Handle lockable in 'off' position.
- F. Enclosure:
  - 1. NEMA 1: Dry locations/Indoors.
  - 2. NEMA 3R: Damp or wet locations/Outdoors.

# 2.5 ENCLOSED CIRCUIT BREAKERS

- A. Molded case circuit breakers:
  - 1. 1-, 2-, or 3-pole bolt on, single-handle common trip, 600VAC or 250VAC as indicated on drawings.
  - 2. Overcenter toggle-type mechanism, quick-make, quick-break action. Trip indication is by handle position.
  - 3. Calibrate for operation in 40C ambient temperature.
  - 4. 15 to 150 Amp Breakers: Permanent trip unit containing individual thermal and magnetic trip elements in each pole.
  - 5. 151 to 400 Amp Breakers: Variable magnetic trip elements. Provide push-to-trip button on cover of breaker for mechanical tripping.
  - 6. Greater than 401 Amp: Electronic trip type with adjustments for long-time, instantaneous, and short-time functions. Provide ground fault function for breakers greater than 400 amps.
  - 7. Provide handle mechanisms that are lockable in the open (off) position.
  - 8. Circuit breakers to have minimum symmetrical interrupting capacity as indicated on Drawings.
- B. Enclosure:
  - 1. NEMA 1: Dry locations/Indoors.
  - 2. NEMA 3R: Damp or wet locations/Outdoors.
- C. Removable cover, galvanized steel enclosure, powder coat painted.

## 2.6 MOLDED CASE SWITCHES

- A. Provide cover padlock provision.
- B. Provide trip unit with no overcurrent, overload, or low level fault protection. Trip unit to be high instantaneous magnetic fixed trip type with magnetic trip reset at factory to interrupt high fault currents at or above preset level.

- C. Enclosure:
  - 1. NEMA 1: Dry locations/Indoors.
  - 2. NEMA 3R: Damp or wet locations/Outdoors.

### PART 3 – EXECUTION

### 3.1 COORDINATION

- A. Obtain and review the submitted product data for equipment furnished by the Owner, and furnished under other Divisions of this contract, particularly under Divisions 22 and 23.
- B. Confirm the equipment nameplate maximum overcurrent protection (MOCP) and make accommodations and adjustments to switches, fuses and circuit breakers as necessary to coordinate with the nameplate rating.

## 3.2 INSTALLATION

- A. Provide disconnecting means within sight of each motor controller and of each motor. Motor controller disconnecting means equipped with lock-out/tag-out padlock provisions do not require a disconnect switch at the controlled motor location. Locate disconnect means in view of and not inside of equipment, such that tools are not needed to remove covers to access the disconnecting means.
- B. Install in accordance with manufacturer's instructions.
- C. Install fuses in fusible disconnect switches. Coordinate fuse ampere rating with installed equipment. Do not provide fuses of lower ampere rating than motor starter thermal units.
- D. Provide engraved nameplates per Section 26 05 53, Identification for Electrical Systems.
- E. Provide arc flash warning labels.
- F. Apply neatly typed adhesive tag on inside door of each fusible switch indicating NEMA fuse class and size installed.

## END OF SECTION 26 28 16

## SECTION 263323 - CENTRAL BATTERY EQUIPMENT FOR EMERGENCY LIGHTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes the following central battery and power conversion equipment rated 600 V and less for emergency lighting:
  - 1. Uninterruptible (UPS-type) central battery equipment.

#### 1.3 **DEFINITIONS**

- A. DDC: Direct digital control.
- B. IBC: International Building Code.
- C. Interruptible: As used in the Section Text, an off-line, passive-standby or line-interactive, inverter-only unit, with an intentional interruption of power to the load until an internal transfer switch picks up and transfers the load to the unit's inverter and internal battery source on loss of the "normal" source, and then retransfers to the "normal" source when it is restored. Transfer time can be "slow" (up to approximately 1 second) or "fast" (2-4 ms or 40-50 ms, depending on manufacturer).
- D. LED: Light-emitting diode.
- E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
- F. NiCd: Nickel cadmium.
- G. OCPD: Overcurrent protective device.
- H. PC: Personal computer.
- I. PWM: Pulse-width modulated.
- J. TDD: Total demand (harmonic current) distortion (also listed as "THD" in catalog data by manufacturers).
- K. THD(V): Total harmonic voltage demand.

- L. Uninterruptible: As used in the Section Text, an on-line, double-conversion (rectifier/inverter) unit, with no interruption of power to the load on interruption and restoration of the "normal" source.
- M. UPS: Uninterruptible power supply.
- N. VRLA: Valve-regulated lead acid.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type and rating of central battery equipment unit.
  - 1. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, shipping splits, and furnished options, specialties, and accessories.

### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For central battery equipment to include in emergency, operation, and maintenance manuals.
  - 1. In addition include the following:
    - a. Manufacturer's written instructions for testing central battery equipment.
    - b. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
    - c. Manufacturer's written instructions for selecting and setting field-adjustable controls and status and alarm points

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in fully enclosed vehicles.
- B. Store equipment in spaces having environments controlled within manufacturers' written instructions for ambient temperature and humidity conditions for non-operating equipment.

### 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
  - 2. Altitude: Exceeding 400 feet.
- B. Interruption of Existing Electrical Distribution Systems: Do not interrupt electrical distribution systems within facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

- 1. Notify Architect no fewer than two days in advance of proposed interruption of electrical systems.
- 2. Indicate method of providing temporary electrical service.
- 3. Do not proceed with interruption of electrical systems without Architect's written permission.
- 4. Comply with NFPA 70E.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for central battery equipment, including clearances between central battery equipment and adjacent surfaces and other items.

## 1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace central battery equipment that fails in materials or workmanship within specified warranty period. Special warranty, applying to batteries only, applies to materials only, on a prorated basis, for period specified.
  - 1. Warranty Period: Include the following warranty periods, from date of Substantial Completion:
    - a. Central Battery Equipment (excluding Batteries): One year.
    - b. Batteries:
      - 1) Full Warranty: One year.
      - 2) Pro Rata: 5 years minimum.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Central battery equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. The designated central battery equipment shall be tested and certified by an NRTL as meeting ICC-ES AC 156 test procedure requirements.

## 2.2 UNINTERRUPTIBLE (UPS-TYPE) CENTRAL BATTERY EQUIPMENT

- A. Manufacturers:
  - 1. Dual-Lite DLS
  - 2. Controlled Power Company ELC
  - 3. Or approved equal.
- B. General Requirements for Central Battery Equipment:

- 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. NRTL Compliance: Fabricate and label central battery equipment to comply with UL 924.
- 3. Comply with the IBC, NFPA 70, and NFPA 101.
- 4. Comply with NEMA PE 1.
- C. Performance Requirements for UPS-Type Central Battery Equipment:
  - 1. Type: On-line, double conversion.
  - 2. Continuously provide uninterrupted ac power to connected emergency electrical lighting system.
  - 3. Automatic Operation:
    - a. Normal Conditions: Supply the load with ac power flowing from normal ac power input terminals, through rectifier and inverter, with battery connected in parallel with rectifier output.
    - b. Abnormal Supply Conditions: If normal ac supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, battery supplies constant, regulated, inverter ac power output to the load without switching or disturbance.
    - c. If normal power fails, battery continues to supply regulated ac power through the inverter to the load without switching or disturbance.
    - d. When power is restored at normal supply terminals of system, controls automatically synchronize inverter with the external source before transferring the load. Rectifier then supplies power to the load through the inverter and simultaneously recharges battery.
    - e. If battery becomes discharged and normal supply is available, rectifier charges battery. When battery is fully charged, rectifier automatically shifts to float-charge mode.
    - f. If any element in the rectifier/inverter string fails and power is available at normal supply terminals of system, static transfer switch transfers the load to normal ac supply circuit without disturbance or interruption of supply.
    - g. If a fault occurs in system supplied by the inverter output, and current flows in excess of the overload rating of the inverter, static transfer switch operates to bypass fault current to normal ac supply circuit for fault clearing.
    - h. When fault has cleared, static transfer switch returns the load to inverter output.
    - i. If battery is disconnected, inverter continues to supply power to the load with no degradation of its regulation of voltage and frequency of output bus.
  - 4. Manual Operation:
    - a. Turning inverter off causes static transfer switch to transfer the load directly to normal ac supply circuit without disturbance or interruption.
    - b. Turning inverter on causes static transfer switch to transfer the load to inverter.
- D. Unit Operating Requirements:
  - 1. Input AC Voltage Tolerance: Plus 10 and minus 15 percent of central battery equipment input voltage rating.
  - 2. Input Frequency Tolerance: Plus or minus 5 percent of central battery equipment frequency rating.
  - 3. Synchronizing Slew Rate: 1 Hz per second, maximum.

- 4. Minimum Off-Line Efficiency: 97 percent at 60 Hz, full load.
- 5. Minimum Displacement Primary-Side Power Factor: 97 percent under any load or operating condition.
- 6. Ambient Temperature Rating (Other Than Batteries): Not less than 68 deg F (20 deg C) and not exceeding 86 deg F (30 deg C).
- 7. Ambient Storage Temperature Rating (Other Than Batteries): Not less than minus 4 deg F (minus 20 deg C) and not exceeding 158 deg F ((70 deg C).)
- 8. Ambient Temperature Rating (Batteries): Not less than 32 deg F (0 deg C) and not exceeding 104 deg F (40 deg C).
- 9. Ambient Storage Temperature Rating (Batteries): Not less than 0 deg F (minus 18 deg C) and not exceeding 104 deg F ((40 deg C).)
- 10. Humidity Rating: Less than 95 percent (noncondensing).
- 11. Altitude Rating: Not exceeding 400 feet.
- E. Inverter and Controls Logic: Microprocessor based, isolated from all power circuits; provides complete self-diagnostics, periodic automatic testing and reporting; with alarms.
- F. Controls and Indication:
  - 1. Status Indication: Door-mounted, labeled LED indicators or digital screen displaying the following conditions:
    - a. Normal power available.
    - b. Status of system.
    - c. Battery charging status.
    - d. On battery power.
    - e. System fault.
    - f. External fault.
  - 2. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English language display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.
    - a. Keypad: In addition to required programming and control keys, include the following:
      - 1) Control Authority: Supports at least three conditions: Off, local manual control at unit and local automatic control at unit.
- G. Self-Protection and Reliability Features:
  - 1. Integral, programmable, self-diagnostic and self-test circuitry; with alarms and logging.
  - 2. Battery deep-discharge and self-discharge protection; with alarms.
  - 3. Battery self-test circuitry; with alarms and logging.
- H. Integral Input Disconnecting Means and OCPD: Thermal-magnetic circuit breaker, complying with UL 489.
  - 1. Integrated Equipment Minimum Short-Circuit Current (Withstand) Rating: 10kA.
- I. Rectifier:
  - 1. Description: Solid state, with the following operational features:

- a. Automatically convert incoming ac voltage to regulated dc bus voltage, with less than 2 percent rms ripple voltage with inverter fully loaded and batteries disconnected.
- b. Rectified Efficiency: Not less than 97 percent.
- c. Generator compatible.
- J. Inverter:
  - 1. Description: Solid-state, high-frequency, PWM type, with the following operational features:
    - a. Automatically regulate output voltage to within plus or minus 5 percent, for all load ranges and for maximum 25 percent step-load changes; regulation may increase to 8 percent for 100 percent step-load changes, with recovery within 3 cycles.
    - b. Automatically regulate output frequency to within plus or minus 0.05 Hz, from no load to full load, at unity power factor, over the operating range of battery voltage.
    - c. Inverter Overload Capability: 115 percent for 10 minutes; 150 percent surge for 10 seconds.
    - d. Brownout Protection: Produces rated power without draining batteries when input voltage is down to 75 percent of normal.
    - e. Load Power Factor: 0.5 lead to 0.5 lag.
- K. Battery Charger:
  - 1. Description: Solid state, variable rate, temperature compensated; automatically maintains batteries in fully charged condition when normal power is available.
  - 2. Maximum Battery Recharge Time from Fully Discharged State: 24 hours.
  - 3. Low-voltage disconnect circuit reduces battery discharge during extended power outages, monitors battery voltage, and disconnects inverter when battery voltage drops to no less than 85.7 percent of nominal voltage.
- L. Batteries:
  - 1. Description: Standard VRLA batteries.
    - a. Capable of sustaining full-capacity output of inverter unit for minimum of 90 minutes.
  - 2. Battery Disconnect and OCPD: Manufacturer's standard.
- M. Integral Output Disconnecting Means and OCPD:
  - 1. Single-Output OCPD: Thermal-magnetic circuit breaker, complying with UL 489; voltage rating matching unit output voltage rating; 20 A, single pole.
    - a. Normally Closed: 1

## 2.3 ENCLOSURES

A. Central Battery Equipment Enclosures: NEMA 250, to comply with environmental conditions at installed location.

- 1. Dry and Clean Indoor Locations: Type 1 steel cabinets with access to components through hinged doors with flush tumbler lock and latch.
- 2. Finish: Manufacturer's standard baked-enamel finish over corrosion-resistant prime treatment.

### PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Receive, inspect, handle, and store central battery equipment according to NECA 411.
- B. Examine areas, surfaces, and substrates to receive central battery equipment, with Installer present, for compliance with requirements for installation tolerances, structural support, ventilation, temperature, humidity, and other conditions affecting performance of the Work. Remove existing shelfs in installation area.
  - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment will be installed, before installation begins.
- C. Examine equipment before installation. Reject equipment that is wet, moisture damaged, or mold damaged.
- D. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Coordinate layout and installation of central battery equipment with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install central battery equipment and accessories according to NECA 411.
- C. Wall-Mounted Central Battery Equipment: Install central battery equipment on walls with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For units not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Comply with NECA 1.
- F. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions

where unenclosed wiring method may be used for low-voltage control and alarm wiring. Conceal raceway and cables except in unfinished spaces.

- 1. Install plenum cable in environmental air spaces, including plenum ceilings.
- 2. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- G. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- H. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

### 3.3 CONNECTIONS

- A. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams unless otherwise indicated.
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
  - 1. Separately Derived Systems: Make grounding connections to grounding electrodes and bonding connections to metallic piping systems as indicated; comply with NFPA 70.
- C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.4 CONTROL WIRING INSTALLATION

- A. Install wiring between central battery equipment and remote devices and facility's central-control system.
- B. Bundle, train, and support wiring in enclosures.

### 3.5 IDENTIFICATION

- A. Identify central battery equipment, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
  - 1. Label central battery equipment with engraved nameplates.
  - 2. Label each separate cabinet, for multicabinet units.

### 3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

- 1. Inspect central battery equipment, wiring, components, connections, and equipment installation. Test and adjust components and equipment.
- 2. Perform each visual and mechanical inspection and electrical test stated in manufacturer's written instructions.
- 3. Perform a load-duration test at rated voltage and rated output current to verify the correct functional operation of the unit under full-load stable operating conditions for the minimum time limits required by UL 924. Monitor and record ambient temperature and temperatures within the unit.
- 4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Central battery equipment will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies central battery equipment and describes all test results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

## 3.7 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

### 3.8 ADJUSTING

- A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- B. Set field-adjustable switches, auxiliary relays, and other adjustable parts.
- C. Adjust the trip settings of thermal-magnetic circuit breakers with adjustable, instantaneous-trip elements; install fuses if not factory installed.
- D. Set the automatic system test parameters.

### 3.9 **PROTECTION**

A. Replace central battery equipment whose interiors have been exposed to water or other liquids prior to Substantial Completion.

### 3.10 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain central battery equipment, and to use and reprogram microprocessor-based control, monitoring, and display functions.

### END OF SECTION 263323

## SECTION 26 43 00 - SURGE PROTECTIVE DEVICES

### PART 1 – GENERAL

### 1.1 SUMMARY

- A. Work Included:
  - 1. SPD for Service Entrance Modular Type
  - 2. SPD for Distribution Panels Nonmodular Type

### 1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements (if available) apply to this Section.

### **1.3 REFERENCES AND STANDARDS**

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).
- B. In addition, meet the following:
  - 1. Listed per UL 1449, third edition, and complimentary listed per UL 1283 as FRI/EMI filter.
  - 2. Comply with ANSI/IEEE C62.45 test procedures for Category-C3 established in C62.41.2 and CSA certified (C22.2).

# 1.4 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

## 1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

### 1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available).

### **PART 2- PRODUCTS**

### 2.1 MANUFACTURERS

- A. Current Technology
- B. Eaton Electrical
- C. Lea International

- D. Liebert
- E. Square D
- F. Surge Suppression Inc. (SSI)
- G. Or approved equivalent.

### 2.2 SPD FOR SERVICE ENTRANCE - MODULAR TYPE

- A. List SPD in accordance with UL 1449 (third edition), Standard for Safety, Surge Protective Devices, and UL 1283, Electromagnetic Interference Filters.
- B. Provide SPD with copper bus bars for surge current path. Small gauge round wiring, plug-in type connections, or printed circuit boards not to be used in path for surge current diversion. Equally distribute surge current to individually fused MOV components to ensure equal stressing and maximum performance. Surge suppression platform must provide equal impedance paths to each matched (plus or minus one volt) MOV.
- C. Construct SPD using field replaceable surge current diversion modules (MOV based). Each module fused with user replaceable 200,000 AIC rated fuses. Monitor status of each module and MOV and indicate on front of SPD's enclosure as well as on each module.
- D. Encapsulated SPD, whether modular or chase nipple units, utilizes an encapsulant that is UL listed and holds 94-V2 fire retardant rating. Allow no encapsulant compounds that incorporate epoxy.
- E. Equip SPD with an audible alarm that activates when one of surge current modules have failed. Provide an alarm on/off switch to silence the alarm. Provide an alarm push-to-test switch to test alarm. Locate switches and alarm on front cover of SPD's enclosure. Equip unit with an Event Counter that will indicate how many surges, sags, swells and outages have occurred at the location.
- F. Meet or exceed the following criteria:
  - 1. Maximum Single Impulse Current Rating: No less than 200 kA per phase.
  - Pulse Life Test: Capable of protecting against and surviving 5000 ANSI/IEEE C62.41.2 Category-C3 transients without failure or degradation of UL 1449, third edition, clamp voltage by more than 10 percent.
  - 3. UL 1449, third edition, clamping voltage not-to-exceed exceed the following:

VOLTAGE	L-G	L-N	N-G
208Y/120V	800V	800V	800V
480Y/277V	1200V	1200V	1200V

4. ANSI/IEEE C62.41.2 (2002) Category-C3 clamping voltage not to exceed the following:

VOLTAGE	L-N	L-5	N-G
208Y/120V	470V	470V	470V

480Y/277V	920V	920V	800V

- G. Provide response time that is no greater than five nanoseconds for any of individual protection modes.
- H. Provide SPD designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.
  - 1. Provide visible indication of proper SPD connection and operation. Indicator lights indicates which phase as well as which module is fully operable.
  - 2. Equip SPD with the following items:
    - a. Provide connector along with dry contacts (normally open or normally closed) to allow connection to remote monitoring system.
    - b. Output of dry contacts indicates failure of phase or entire unit.
  - 3. Provide terminals for necessary power and ground connections.
  - 4. Provide SPD with minimum EFI/RFI filtering of 30dB at 100KHZ with an insertion loss ratio of 316:1 using Military Standard 220A methodology.
  - 5. Provide SPD with 1 year warranty, incorporating unlimited replacement parts if they are destroyed by transients during warranty period.

### 2.3 SPD FOR DISTRIBUTION PANELS - NONMODULAR TYPE

- A. List SPD in accordance with UL 1449 (third edition), Standard for Safety, Surge Protective Devices, and UL 1283, Electromagnetic Interference Filters.
- B. Provide SPD with copper bus bars for surge current path. Small gauge round wiring, plug-in type connections, or printed circuit boards not be used in path for surge current diversion. Equally distribute surge current to MOV components to ensure equal stressing and maximum performance. Surge suppression platform must provide equal impedance paths to each matched MOV.
- C. Use no plug in component modules or printed circuit boards as surge current conductors. Hardwire internal components with connections utilizing low impedance conductors and compression fittings.
- D. In order to isolate SPD under any fault condition, manufacturer to provide:
  - 1. Individually fuse the MOV via copper fuse. Copper fuse provides protection during high (ka) surge events.
  - 2. Equip MOVs with thermal fuse which allows disconnection of suppression component at overheating stage common during TOV.
  - 3. Test over-current protection components in compliance with UL 1449 (third edition) -Limited Current Test and AIC rating test.
- E. Equip SPD with an audible alarm that activates when one of surge current modules have failed. Provide an alarm on/off switch to silence alarm. Provide an alarm pushto-test switch to test the alarm. Locate switches and alarm on the front cover of the SPD's enclosure.
- F. Provide SPD that Meet or Exceed the Following Criteria:

- 1. Provide maximum single impulse current rating at no less than 100 kA per phase. Manufacturers must provide documented proof of independent third party verification of single impulse current withstand capabilities.
- 2. Pulse Life Test: Capable of protecting against and surviving 2000 ANSI/IEEE C62.41.2 Category-C3 transients without failure or degradation of UL 1449 (third edition) clamp voltage by more than 10 percent.
- 3. UL 1449 (third edition) clamping voltage not to exceed the following:

VOLTAGE	L-G	L-N	N-G
208Y/120V	800V	800V	800V
480Y/277V	1200V	1200V	1200V

- 4. Nominal discharge current of 20KA I (n).
- G. Make SPD of solid-state components which operate bidirectionally.
- H. Provide SPD with response time no greater than five nanoseconds for individual protection modes.
  - 1. SPD designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.
- I. Provide visible indication of proper SPD connection and operation. Provide 10 year warranty, incorporating unlimited replacements of SPD if they are destroyed by transients within warranty period.
- J. Provide SPD designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.
  - 1. Provide terminals for necessary power and ground connections.
  - 2. Provide SPD with minimum EFI/RFI filtering of 30dB at 100KHZ with an insertion loss ratio of 316:1 using Military Standard 220A methodology.
  - 3. Provide SPD with 10 year warranty, incorporating unlimited replacement parts if they are destroyed by transients during warranty period.

## PART 3 – EXECUTION

### 3.1 SERVICE ENTRANCE

- A. Install SPD on load side of service entrance as directed by manufacturer's installation instructions. Provide 3 pole breaker for disconnect in service entrance equipment, size breaker to manufacturers installation instructions.
- B. Install one primary SPD at each utility service entrance to facility, according to manufacturer's recommendations.
- C. Integrate SPD unit into switch gear to maximize performance and reliability.
- D. Bond SPD's ground to service entrance ground.

## 3.2 DISTRIBUTION PANELS

A. Install one secondary SPD at each distribution panel location as indicated on

Drawings. SPD unit to be integral to panelboard.

## END OF SECTION 26 43 00

### SECTION 26 51 00 - LIGHTING

### PART 1 – GENERAL

### 1.1 SUMMARY

- A. Work Included:
  - 1. Luminaires
  - 2. Emergency Lamp Power Supply
- B. Provide wiring for complete and operating lighting system.

### 1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements (if available) apply to this Section.

### 1.3 REFERENCES AND STANDARDS

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements (if available) and Section 26 51 19, LED Interior Lighting.
- B. In addition, meet the following:
  - 1. NECA 500 Commercial Lighting

## 1.4 SUBMITTALS

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01 General Requirements (if available).
- B. In addition, provide:
  - 1. Submit:
    - a. Luminaires: Include electrical ratings, dimensions, mounting, material, required clearances, terminations, wiring and connection diagrams, photometric data, diffusers, and louvers.
    - b. Emergency Lighting Equipment
  - 2. Submittal Cutsheets: Highlight, circle or otherwise graphically indicate which option(s) are being selected for the products submitted. Cutsheets that are not edited to indicate which products and options are submitted for this project or that list only catalog numbers to identify submitted options are not acceptable.
  - 3. Specified manufacturers are approved to submit bid. However, inclusion does not relieve manufacturer from supplying product as described.
  - 4. Provide the following operating and maintenance instructions as required by Section 26 00 00, Electrical Basic Requirements:
    - a. Luminaires
    - b. Emergency Lighting Equipment

## 1.5 QUALITY ASSURANCE

- A. Quality assurance as required by Section 26 00 00, Common Work Results for Electrical and Division 01, General Requirements (if available).
- B. In addition, meet the following:
  - 1. Provide luminaires acceptable to code authority for application and location installed.
  - 2. Comply with applicable ANSI standards.
  - 3. Comply with applicable NEMA standards.
  - 4. Provide luminaires and lampholders that comply with UL standards and have been listed and labeled for location and use indicated by a testing agency acceptable by the AHJ (e.g. UL, ETL, and the like).
  - 5. Comply with NEC as applicable to installation and construction of luminaires.
  - 6. Comply with fallout and retention requirements of CBC, IBC, or OSSC for diffusers, baffles, and louvers.
  - 7. Provide similar lamps and ballasts from common manufacturer (e.g. all MR lamps from Ushio) unless indicated otherwise in the Luminaire Schedule.

## 1.6 WARRANTY

- A. Warranty as required by Section 26 05 00, Common Work Results for Electrical and Division 01, General Requirements (if available).
- B. In addition, provide:
  - 1. Warranty: LED systems and complete luminaires must have manufacturer's warranty of a minimum of (1) year from date of substantial completion, including driver.

### PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. As specified in drawings (luminaire schedule).
- B. Or approved equivalent.

### 2.2 LUMINAIRES

- A. Luminaires: Reference description and manufacturers in Luminaire Schedule on drawings.
- B. Where recessed luminaires are installed in cavities intended to be insulated, provide IC rated luminaires or other code approved installation.
- C. UL label luminaires installed under canopies, roof or open porches, and similar damp or wet locations, as suitable for damp or wet location.
- D. Suspended luminaires: Provide minimum 24-inch adjustability in aircraft cable length where used.
- E. Recessed Luminaires: Frame compatible with ceiling material installed at particular luminaire location. Provide proper factory trim and frame for luminaire to fit location and ceiling material. Verify with Architectural Reflected Ceiling Plan prior to submittals.
- F. Finishes:

- 1. Manufacturer's standard finish (unless otherwise indicated) over corrosion resistant primer.
- 2. Interior Light Reflecting Finishes: White or specular finish with not less than 85 percent reflectance.
- 3. Exterior Finishes: As detailed in luminaire schedule or on drawings. Refer cases of uncertain applicability to Architect for resolution prior to release for fabrication.
- G. Light Transmitting Components:
  - 1. Plastic diffusers, molded or extruded of 100 percent virgin acrylic.
  - 2. Prismatic acrylic, extruded, flat diffusers, 0.125-inch overall thickness, unless otherwise noted.

## 2.3 EMERGENCY LAMP POWER SUPPLY

A. Description: Provided through dedicated egress luminaires routed through UL924 relays.

# PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Install luminaires securely, in neat and workmanlike manner.
- B. Install luminaires of types indicated where shown and at indicated heights in accordance with manufacturer's written instructions and with recognized industry practices to ensure that luminaires comply with requirements and serve intended purposes.
- C. Align, mount and level luminaires uniformly. Use ball hangers for suspended stem mounted luminaires.
- D. Avoid interference with and provide clearance from equipment. Where indicated locations for luminaires conflict with locations for equipment, change locations for luminaire by minimum distance necessary as directed by Architect.
- E. Suspended Luminaires: Mounting heights indicate clearances between bottom of luminaire and finished floors.
- F. Emergency Egress Luminaires: Provide unswitched emergency circuit to exit signs and emergency luminaires.
- G. Interior Luminaire Supports:
  - 1. Support Luminaires: Anchor supports to structural slab or to structural members within a partition, or above a suspended ceiling.
  - 2. Maintain luminaire positions after cleaning and relamping.
  - 3. Support luminaires without causing ceiling or partition to deflect.
  - 4. Provide mounting supports for recessed and pendant mounted luminaires as required by IBC.
- H. Wiring:

- 1. Recessed luminaires to be installed using flexible metallic conduit with luminaire conductors spliced to branch circuit conductors in nearby accessible junction box over ceiling. Junction box fastened to building structural member within 6-feet of luminaire.
- 2. Luminaires for lift out and removal from ceiling pattern without disconnecting conductors or defacing ceiling materials.
- 3. Flexible connections where permitted to exposed luminaires; neat and straight, without excess slack, attached to support device.
- 4. Install junction box, flexible conduit and high temperature insulated conductors for through wiring of recessed luminaires.
- I. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- J. Support luminaires larger than 2- by 4-foot size independent of ceiling framing.
- K. Locate recessed ceiling luminaires as indicated on architectural reflected ceiling plan.
- L. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- M. Exposed Grid Ceilings:
  - 1. Support surface mounted luminaires in grid ceiling directly from building structure.
  - 2. Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires.
  - 3. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.
- N. Install recessed luminaires to permit removal from below.
- O. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- P. Install clips to secure recessed grid-supported luminaires in place.
- Q. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Architectural Drawings.
- R. Install accessories furnished with each luminaire.
- S. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- T. Bond products and metal accessories to branch circuit equipment grounding conductor.
- U. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.
- V. Where manufactured wiring assemblies are used, insure that wiring assembly manufacturer sends components to appropriate luminaire manufacturer for respective installation of proper components.

## 3.2 COORDINATION

- A. Coordination of Conditions: Coordinate ceiling construction, recessing depth and other construction details prior to ordering luminaires for shipment. Refer cases of uncertain applicability to Architect for resolution prior to release of luminaires for shipment. Where luminaires supplied do not match ceiling construction, replace luminaires at no cost to Owner.
- B. Electrical drawings are schematic, identifying quantity and type of luminaires used and their approximate location, but are not to be used for dimensional purposes. Reference architectural drawings for exact locations, including mounting heights.
- C. Provide lighting indicated on drawings with luminaire of the type designated and appropriate for location.
- D. Where remote drivers are required, insure adequate accessibility to drivers. Upsize conductors between luminaire and ballast to accommodate voltage drop.

### 3.3 FIELD QUALITY CONTROL

- A. Perform field inspection in accordance with Division 01, General Requirements (if available).
- B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

#### 3.4 ADJUSTING

- A. Aim and adjust luminaires as indicated.
- B. Focus and adjust floodlights, spotlights and other adjustable luminaires, with Architect, at such time of day or night as required.
- C. Align luminaires that are not straight and parallel/perpendicular to structure.
- D. Position exit sign directional arrows as indicated.

### 3.5 CLEANING

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from enclosures.
- C. Clean paint splatters, dirt, dust, fingerprints, and debris from luminaires.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damaged finishes per by manufacturer's instructions.

### 3.6 CLOSEOUT ACTIVITIES

A. Demonstrate luminaire operation.

END OF SECTION 26 51 00
## SECTION 28 31 00 - FIRE DETECTION AND ALARM

### PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Existing fire-alarm control unit.
  - 2. Manual fire-alarm boxes.
  - 3. System smoke detectors.
  - 4. Heat detectors.
  - 5. Notification appliances.
  - 6. Addressable interface device.
  - 7. Digital alarm communicator transmitter.

#### 1.2 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FACP: Fire Alarm Control Panel.
- C. HLI: High Level Interface.
- D. NICET: National Institute for Certification in Engineering Technologies.
- E. VESDA: Very Early Smoke-Detection Apparatus.

## 1.3 ACTION SUBMITTALS

- A. General Submittal Requirements:
  - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
  - 2. Shop Drawings shall be prepared by persons with the following qualifications:
    - a. Trained and certified by manufacturer in fire-alarm system design.
    - b. NICET-certified, fire-alarm technician; Level III minimum.
    - c. Licensed or certified by Authorities Having Jurisdiction.
- B. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.

- 2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
- 3. Indicate audible appliances required to produce square wave signal per NFPA 72.
- C. Product Data: For each type of product, including furnished options and accessories.
  - 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
  - 2. Include rated capacities, operating characteristics, and electrical characteristics.
- D. Shop Drawings: For fire-alarm system.
  - 1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
  - 2. Include plans, elevations, sections, details, and attachments to other work.
  - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
  - 4. Detail assembly and support requirements.
  - 5. Include voltage drop calculations for notification-appliance circuits.
  - 6. Include input/output matrix.
  - 7. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
  - 8. Include performance parameters and installation details for each detector.
  - 9. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  - 10. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
    - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    - b. Show field wiring required for HVAC unit shutdown on alarm.
    - c. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' control system.
    - d. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by fire.
    - e. Locate detectors according to manufacturer's written recommendations.
    - f. Show air-sampling detector pipe routing.
  - 11. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

## 1.4 CLOSE-OUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
    - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

- b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
- c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
- d. Riser diagram.
- e. Device addresses.
- f. Record copy of site-specific software.
- g. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
  - 1) Equipment tested.
  - 2) Frequency of testing of installed components.
  - 3) Frequency of inspection of installed components.
  - 4) Requirements and recommendations related to results of maintenance.
  - 5) Manufacturer's user training manuals.
- h. Manufacturer's required maintenance related to system warranty requirements.
- i. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.
- B. Software and Firmware Operational Documentation:
  - 1. Software operating and upgrade manuals.
  - 2. Program Software Backup: On USB drive, complete with data files.
  - 3. Device address list.
  - 4. Printout of software application and graphic screens.

### 1.5 REGULATORY REQUIREMENTS

- A. All equipment shall be UL listed and labeled for the intended use.
- B. The equipment and installation shall comply with the current provisions of the following standards:
  - 1. National Electric Code, Article 760.
  - 2. NFPA72 National Fire Alarm Code
  - 3. NFPA101 Life Safety Code
  - 4. Local and State Building Codes.
  - 5. Local Authorities Having Jurisdiction.
  - 6. Americans with Disabilities Act (ADA)
  - 7. Underwriters Laboratories Inc.
  - 8. UL-464 Audible Signaling Appliances
  - 9. UL-1971 Visual Signaling Appliances
  - 10. All other local codes and authorities having jurisdiction.

#### 1.6 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

## 1.7 PROJECT CONDITIONS

A. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

### PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTIONS

- A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.
- B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and voice, horn/strobe evacuation.
- C. Automatic sensitivity control of certain smoke detectors.
- D. All components provided shall be listed for use with the selected system.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. The fire alarm system shall consist of, but not be limited to, the following:
  - 1. Existing fire alarm control panel. Addressable fire alarm panel located in the building riser room/electrical room.
  - 2. Smoke detection shall be provided in the electrical room, work room, conference room, and public spaces including: lounge, lobby, break room, and corridors
  - 3. Heat detectors located in restrooms and janitor room.
  - 4. Manual fire alarm pull stations located at all required egress exits.
  - 5. Audible/Visible Notification
    - a. Appliances including horn/strobe notification appliances provided in corridors, public spaces and in multi person rooms.
    - b. Strobe notification appliances shall be provided in restrooms.
  - 6. Central station alarm connection control.
  - 7. Air handling systems shutdown control.

### 2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. A. Fire-alarm signal initiation shall be by one or more of the following devices:
  - 1. Manual stations.
  - 2. Heat detectors.
  - 3. Smoke detectors.
  - 4. Duct smoke detectors.
  - 5. Automatic sprinkler system water flow.
- B. Fire-alarm signal shall initiate the following actions:

- 1. Continuously operate alarm notification appliances, including voice evacuation notices.
- 2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
- 3. Transmit an alarm signal to the remote alarm receiving station.
- 4. Unlock electric door locks in designated egress paths.
- 5. Activate voice/alarm communication system.
- 6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
- 7. Close smoke dampers in air ducts of designated air-conditioning duct systems.
- 8. Activate emergency lighting control.
- 9. Activate emergency shutoffs for gas and fuel supplies.
- 10. Record events in the system memory.
- 11. Record events by the system printer.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
  - 1. Valve supervisory switch.
  - 2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
  - 3. Loss of communication with any panel on the network.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
  - 1. Open circuits, shorts, and grounds in designated circuits.
  - 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
  - 3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
  - 4. Loss of primary power at fire-alarm control unit.
  - 5. Ground or a single break in internal circuits of fire-alarm control unit.
  - 6. Abnormal ac voltage at fire-alarm control unit.
  - 7. Break in standby battery circuitry.
  - 8. Failure of battery charging.
  - 9. Abnormal position of any switch at fire-alarm control unit or annunciator.
  - 10. Voice signal amplifier failure.
- E. System Supervisory Signal Actions:
  - 1. Initiate notification appliances.
  - 2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
  - 3. Record the event on system printer.
  - 4. Transmit system status to building management system.

### 2.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

## 2.4 FIRE-ALARM CONTROL UNIT

- A. Existing addressable fire alarm control panel:
  - 1. DMP XR550.

### 2.5 MANUAL FIRE-ALARM BOXES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Gamewell FCI by Honeywell.
  - 2. Notifier.
  - 3. Siemens Industry, Inc.; Fire Safety Division.
  - 4. Silent Knight.
- B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
  - 1. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plasticrod type; with integral or attached addressable module arranged to communicate manualstation status (normal, alarm, or trouble) to fire-alarm control unit.
  - 2. Station Reset: Key- or wrench-operated switch.
  - 3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
  - 4. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

#### 2.6 SYSTEM SMOKE DETECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Gamewell FCI by Honeywell.
  - 2. Notifier.
  - 3. Siemens Industry, Inc.; Fire Safety Division.
  - 4. Silent Knight.
- B. General Requirements for System Smoke Detectors:
  - 1. Comply with UL 268; operating at 24-V dc, nominal.
  - 2. Detectors shall be two-wire type.
  - 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
  - 4. Base Mounting: Detector and associated electronic components shall be mounted in a twistlock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
  - 5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  - 6. Integral Visual-Indicating Light: LED type, indicating detector has operated.
  - 7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
    - a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 deg F per minute.

- b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 deg F.
- c. Multiple levels of detection sensitivity for each sensor.
- d. Sensitivity levels based on time of day.
- C. Photoelectric Smoke Detectors:
  - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
  - 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    - a. Primary status.
    - b. Device type.
    - c. Present average value.
    - d. Present sensitivity selected.
    - e. Sensor range (normal, dirty, etc.).
- D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
  - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
  - 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    - a. Primary status.
    - b. Device type.
    - c. Present average value.
    - d. Present sensitivity selected.
    - e. Sensor range (normal, dirty, etc.).
  - 3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
  - 4. Each sensor shall have multiple levels of detection sensitivity.
  - 5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific product size, air velocity, and installation conditions where applied.
  - 6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

### 2.7 HEAT DETECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Gamewell FCI by Honeywell.
  - 2. Siemens Industry, Inc.; Fire Safety Division.
  - 3. Silent Knight.
  - 4. SimplexGrinnell LP.
- B. General Requirements for Heat Detectors: Comply with UL 521.
  - 1. Temperature sensors shall test for and communicate the sensitivity range of the device.

- C. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
  - 1. Mounting: Adapter plate for outlet box mounting.
  - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
  - 1. Mounting: Adapter plate for outlet box mounting.
  - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

### 2.8 NOTIFICATION APPLIANCES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Federal Signal Corporation.
  - 2. Siemens Industry, Inc.; Fire Safety Division.
  - 3. SimplexGrinnell LP.
  - 4. System Sensor.
  - 5. Wheelock; a brand of Eaton.
  - 6. Honeywell.
- B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
  - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
- D. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
  - 1. Rated Light Output:
  - 2. 15/30/75/110 cd, selectable in the field.
  - 3. Mounting: Wall mounted unless otherwise indicated.
  - 4. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
  - 5. Flashing shall be in a temporal pattern, synchronized with other units.
  - 6. Strobe Leads: Factory connected to screw terminals.
  - 7. Mounting Faceplate: Factory finished, white.
- E. Voice/Tone Notification Appliances:
  - 1. Comply with UL 1480.

- 2. Speakers for Voice Notification: Locate speakers for voice notification to provide the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
- 3. High-Range Units: Rated 2 to 15 W.
- 4. Low-Range Units: Rated 1 to 2 W.
- 5. Mounting: Flush, semi-recessed or surface mounted and bidirectional.
- 6. Matching Transformers: Tap range matched to acoustical environment of speaker location.
- F. Addressable Relay Modules:
  - 1. Provide address-setting means on the module. Store an internal identifying code for control panel use to identify the module type.
  - 2. Allow the control panel to switch the relay contacts on command.
  - 3. Have a minimum of two normally open and two normally closed contacts available for field wiring.
  - 4. Listed for controlling HVAC fan motor controllers.

## 2.9 ADDRESSABLE INTERFACE DEVICE

- A. General:
  - 1. Include address-setting means on the module.
  - 2. Store an internal identifying code for control panel use to identify the module type.
  - 3. Listed for controlling HVAC fan motor controllers.
- B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- C. Control Module:
  - 1. Operate notification devices.
  - 2. Operate solenoids for use in sprinkler service.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
  - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
  - 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
  - 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- B. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.
- C. Manual Fire-Alarm Boxes:
  - 1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
  - 2. Mount manual fire-alarm box on a background of a contrasting color.
  - 3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- D. Smoke- or Heat-Detector Spacing:
  - 1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
  - 2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
  - 3. Smooth ceiling spacing shall not exceed 30 feet.
  - 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A or Annex B in NFPA 72.
  - 5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
  - 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.
- E. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.
- F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.
  - 1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.
- G. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.
- I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.
- J. Device Location-Indicating Lights: Locate in public space near the device they monitor.

### 3.3 PATHWAYS

- A. Pathways above recessed ceilings and in non-accessible locations may be routed exposed.
  - 1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.
- B. Pathways shall be installed in EMT.
- C. Exposed EMT shall be painted red enamel.

### 3.4 CONNECTIONS

- A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
  - 1. Smoke dampers in air ducts of designated HVAC duct systems.
  - 2. Electronically locked doors and access gates.
  - 3. Alarm-initiating connection to activate emergency lighting control.
  - 4. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
  - 5. Supervisory connections at valve supervisory switches.
  - 6. Data communication circuits for connection to building management system.
  - 7. Data communication circuits for connection to mass notification system.

### 3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

#### 3.6 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

#### 3.7 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Visual Inspection: Conduct visual inspection prior to testing.

- a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
- b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
- 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
- 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
- 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
- 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

## 3.8 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
  - 2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
  - 3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

# 3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 28 31 00